The Magazine of the Registered Professional Engineer...

American Engineer

JUNE 1959

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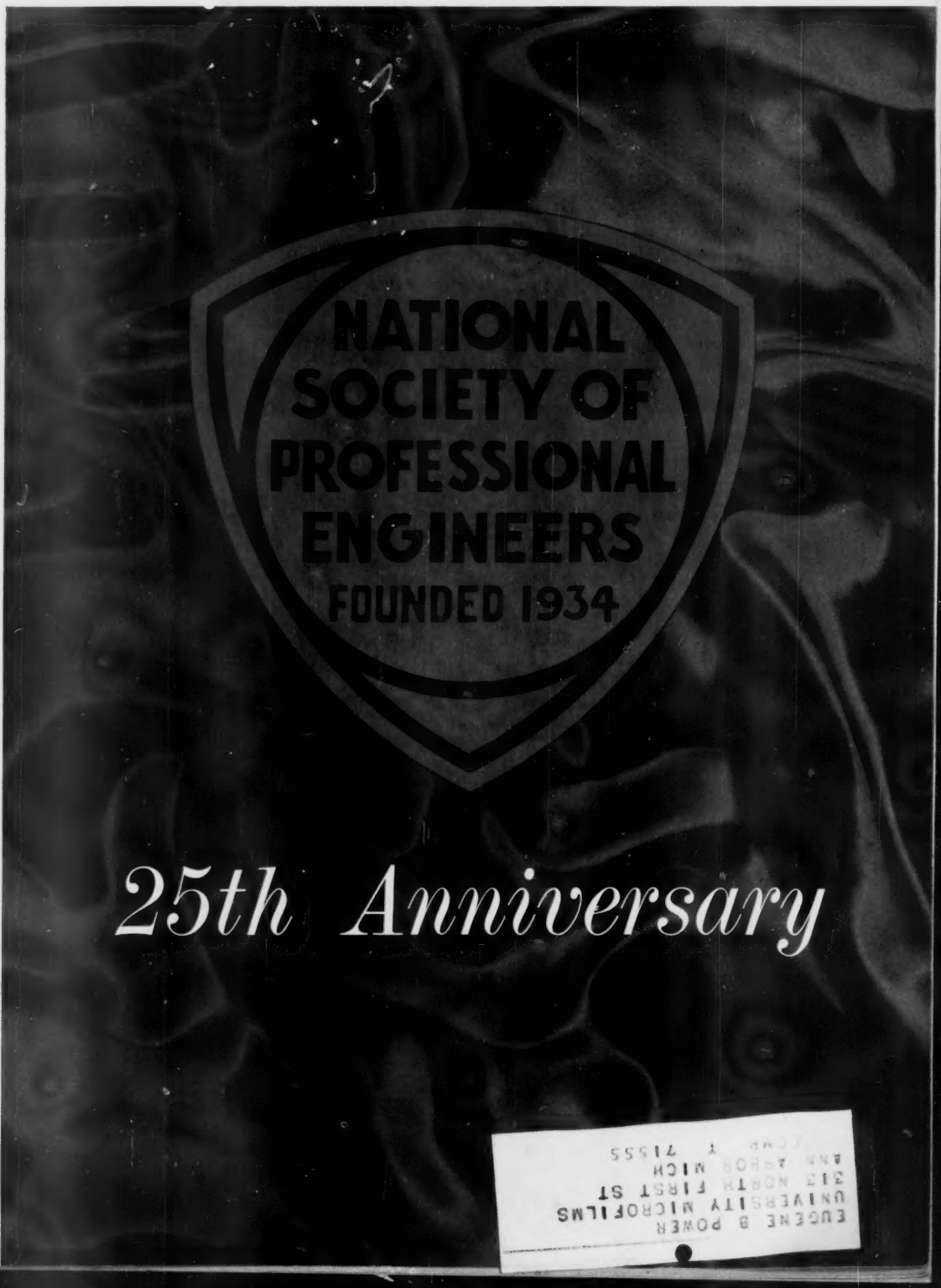

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Executive Research Survey Report

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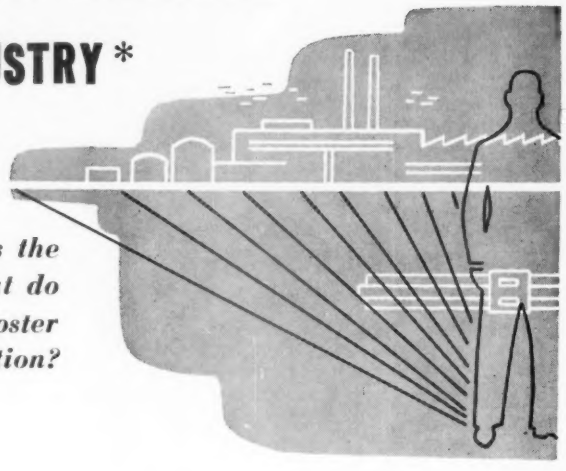

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- **Career Outlook of Professional Engineers**
- **Satisfaction and Frustration on the Job**
- **The Question of Professional Status**
- **Are The Values of the More Successful Engineers Different from the Others?**

* Survey made by the Opinion Research Corporation, Princeton, N. J., for the Professional Engineers Conference Board for Industry, in cooperation with the National Society of Professional Engineers.

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American Engineer

JUNE 1959
Vol. 29, No. 6

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Letters to the Editor

Clarity and Overprints . . .

Dear Editor:

Your article "Clarity: An Essential in the Engineer's Report," by Albrecht and Orel in the April, 1959, issue, was interesting and timely, and is "must" reading in our type of work.

However, why, oh why, was it necessary to superimpose the contrasting silhouette figures across the face of the article when the very meat of the subject was clarity, legibility and readability.

Superimposition of art on the written word is a distraction that is of no benefit to the hard working authors who have a worthwhile message to project and makes close reading and interpretation most onerous.

J. P. Scanlan, P.E.
Waltham, Mass.

► ***Editor's Note:*** **Several letters were received from readers objecting to the overprints. In printing, color must always be used judiciously and in this case the desired effect was apparently lost.**

Studied by Everyone . . .

Dear Editor:

Having just read the April issue of the American Engineer, I wish to compliment you on the article (on clarity in the engineer's report) on page 17. This is a very good article which should be read and studied by everyone, not only engineers. . . .

Fancher E. Wakefield, P.E.
Bayonne, New Jersey

Emphasis on English . . .

Dear Editor:

I have read with some interest the article in the April issue entitled "Clarity: An Essential in the Engineer's Report."

I am reminded of a maxim, which our professor of chemistry painted on the front wall of the chemistry lecture room:

"The English language is the most important tool at your disposal. Learn to use it with precision."
C. W. Foulk.

The chief engineer of a company for whom I worked in my early days told me: "A specification or drawing should be so clear that only gross carelessness can cause its misunderstanding."

A lawyer in a lecture before a group of engineers once said: "The engineer is filled with information, hermetically sealed."

I think that more emphasis should be placed on English in the high schools and in the engineering colleges.

Clyde T. Morris, P.E.
Columbus, Ohio

Writing Reports . . .

Dear Editor:

I have just finished a pleasant evening reading the fine articles which were printed in the April issue of American Engineer. The article "Clarity: An Essential in the Engineer's Report" is stimulating and elevating. Its contents are neither dazzling nor affected, but ring true and prophetic. It should not only be "put in our files" as the editor suggests, but should be conspicuously catalogued for the engineer's frequent reminder that a review of it is there for his refreshment.

Jacob B. Spiegel, P.E.
Topeka, Kans.

In Verse . . .

Dear Editor:

I am pleased that at long last Professors Albrecht and Orel are doing something about a condition that caused me to write the following bit of doggerel for my manuscript book some years ago:

Engineers' Report

"It has been my lot for many years
To read reports by engineers;
Of projects, jobs, and tasks and such
From which I should learn very much.

"Alas! alack! I am undid
And maybe soon I'll flip my lid,
Unless someone can help me out
And tell me what they're all about.

"They do not mean what they say
But start in the middle and go each way.
The outline is missing, the form is lax,
No useful punctuation, or correct syntax.

"The object is a secret beautifully kept,
And conclusions avoided in manner adept.
Oh here I go, I've blown my top,
About a thing no one can stop.

"Just let me say before I'm muzzled,
I'm not the only one who's puzzled."

L. L. Hamilton, P.E.
Scotia, N. Y.

Correction . . .

Joseph Alcabes, an author in last month's issue, was incorrectly listed as an E.I.T. He is a P.E.

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(Circle 1 in Readers' Service Dept.)

A Message from Pres. Dunn on NSPE's Silver Anniversary

Dr. Clark A. Dunn

A QUARTER of a century ago a small group of engineers gathered in the Memorial Room of the Columbia University Club in New York City to consider the formation of the National Society of Professional Engineers. Few at that meeting could have realized the immense growth that lay ahead for both the Society they were founding and the engineering profession as a whole. Today we can look out on an NSPE membership of some 50,000 engineers in fifty state societies and nearly 400 local chapters. The National Society has its headquarters in its own building in Washington, D. C. Nearly 55,000 copies of this magazine are printed and circulated each month. Other NSPE publications on a variety of topics are regularly distributed to industrial executives, educational people, government officials, and individual engineers.

SUCH a listing of the physical "equipment" of the National Society could go on and on for several pages. But much more important, I believe, is a listing which would show the dedication to the concept of service which has always been in the background of NSPE activities. This concept is perhaps expressed most adequately in the preamble to the National Society Constitution adopted in the second organizational meeting of the NSPE founders in 1934:

> "Recognizing that service to society, to state, and to profession is the premise upon which individual opportunity must be built, the National Society of Professional Engineers does herewith dedicate itself to the promotion and protection of the profession of engineering as a social and economic influence vital to the affairs of men and of these United States."

THE best yardstick of the National Society's accomplishments over the past twenty-five years would be a comparison of the extent to which these accomplishments measure up to the ideals of service as called for in the above quotation.

DURING this Silver Anniversary year, we might ask ourselves what lies ahead for the next quarter of a century of NSPE growth and development. The answers to this question may in large part depend on how much influence we are able to bring to bear on the younger generation now in the engineering schools. For it is, of course, these young engineers who must shoulder the responsibility of building upon the foundation of professionalism which has now been erected.

IN the first issue of the AMERICAN ENGINEER magazine in January, 1935, Dr. D. B. Steinman, first NSPE president, wrote an article in which he stated that "the ultimate scope of potential accomplishment of the National Society transcends present realization." I feel that this statement is just as valid today as we look toward the next twenty-five years. Engineering and the sciences have changed the face of the earth and are now altering the composition of the space around our planet. The golden anniversary of the National Society will surely be observed at a time when engineering achievements will have transported man out into the solar system and beyond.

LET it be our hope and prayer, then, that the individuals who are charged with the responsibility of guiding National Society policy and activity through the next generation will hold themselves unswervingly to the task of building for the kind of profession which will face up to the challenges of the times.

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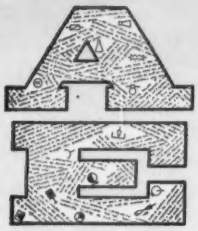

"This Month"

Twenty-five years. Certainly not a long time as history is measured. Yet desire and purposefulness tend to stretch the years and it is this single fact which impresses one as he reviews NSPE's relatively brief span of life. Accomplishment by dedicated men can move quickly, and that is what happened in the professional engineering movement. This is NSPE's twenty-fifth anniversary and President Clark A. Dunn comments briefly about it on page 5.

"One of the major scientific breakthroughs of all time." That's how Secretary of the Interior Fred Seaton describes the latest developments in the desalting of water. Read on page 21 how professional engineers are working for a water-hungry America.

"Company Report: Pan Am at Cape Canaveral" begins on page 27 and tells how engineers of many specialties help make our largest missile launching site tick.

Baltimore's famous harbor tunnel—the longest, 7,650 feet, trench type in the world—is now a year-and-a-half old. How successful has it been in solving one of this major city's worst traffic snarls? Read the full report which begins on page 32.

Consulting engineers and others will want to file for future references the excellent analysis of the Wage-Hour Act as it applies to consulting engineering firms. On page 35.

The staggering death toll our highways take every day has been almost talked to death but what is new is that experts are now relying more than ever upon the engineer to do something lasting about it. See page 37.

Around the profession for the latest news:

General News: NSPE holds reservations concerning the proposed Cabinet-level Department of Science and Technology. In other news, Senator George Smathers has introduced in the Senate a new retirement bill patterned after the recently passed House Keogh-Simpson bill.

Consulting: The lead story reports NSPE's protest of the Federal per diem rate for consultants. Testimony was given before House and Senate Appropriation Committees.

In Education we find the announcement of the five NSPE-Armco scholarship winners. Other news: ASEE meeting set in Pittsburgh; General Electric engineer encourages his town to promote scholarships, and Tau Beta Pi announces fellowship winners.

In Government news is a report on the recent Conference on Scientific Manpower at which the Administration came out against separate classifications and pay schedules for engineers.

Industry: Buffalo engineers vote again for same union; Canadians concerned over advertising, and Westinghouse conducts "personal follow program."

Registration: A good story on how an Oregon court overruled a challenge to the state's registration law on the ground that it "constitutes an unlawful delegation of authority to the State Board. . . ."

See you at the 25th anniversary meeting in New York, June 17-20!

Kenneth E. Trombley

Editor

NSPE Questions Advisability Of New Cabinet-Level Dept.

- Society Lists Three Primary Elements
- Views Given to Senate Subcommittee

The advisability of creating a Department of Science and Technology has been questioned by NSPE in a recent statement before the Subcommittee on Reorganization and International Organization of the U.S. Senate Committee on Government Operations.

"In our view," the National Society stated, "the question of a Cabinet-level Department for Science and Technology involves three primary elements: (1) Coordination of research, both basic and applied; (2) The stimulation of research by the Federal Government; (3) The relative relationship, or prestige, of science and scientists, engineering and engineers, in the Federal structure."

In the matter of coordination, the NSPE statement said that "Each of the agencies proposed to be transferred have distinct missions, and it is far from clear at this point that an administrative layer superimposed on the agencies . . . would result in improved coordination or the lessening of such overlap as may now prevail."

The Society suggested that further detailed study is required on this point.

"The newly-created Federal Council for Science and Technology may be a more suitable instrument to effect improved coordination and cooperation among the various and diversified Federal agencies having responsibility and operational authority in science and engineering," NSPE said. "The Council, while it does not enjoy statutory grounding, nor authority to effectuate organizational or other changes which might be deemed more efficient procedures, does have the advantage of embracing Government-wide coverage, whereas the proposed Department's authority would be limited to those agencies under its domain."

In regard to research, NSPE declared that "in the public mind and in the mind of the Congress the significant object is space travel, not the scientific effort which makes it possible. In our minds, it is open to question whether engineering and science would enjoy greater status and financing if it were placed in the forward position as the end-product. The relative lack of support for basic research, as contrasted with applied research, supports this hypothesis.

"It is entirely possible that a Department of Science and Technology could unintentionally hinder increased emphasis and support for technological activity by the Government by creating an atmosphere in which technology is regarded as the substance, rather than the servant or 'means-to-the end' of a more-readily understandable national objective, e.g., an atomic-powered space vehicle," the statement continued.

The Society agreed that such a Cabinet-level Department would improve the prestige and status for engineers and scientists but that this justification alone is insufficient to warrant its creation.

NSPE noted that many steps have been taken in past several years for improved recognition and prestige, but there remains much that can be done, including a return to the Federal Professional Classification System which was abandoned in 1949.

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(Circle 2 in Readers' Service Dept.)

Dr. Draper Named Head Of Inventors Council

Dr. C. S. Draper, head of the Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, has been named chairman of the National Inventors Council. He succeeds Dr. Charles F. Kettering who held the post from the Council's creation in 1940 until his recent death.

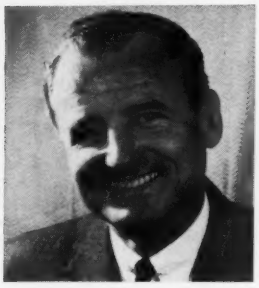
The appointment of Homer H. Ewing, of Greenville, Delaware, a staff member of Du Pont Company's Development Department, to serve as secretary was also announced.

Dr. Draper and Mr. Ewing took office at a meeting of the Council in Washington in May.

The Council serves as liaison agency between the Armed Forces and the nation's civilian inventors. It advises civilian inventors of technical problems standing in the way of national defense developments, evaluates proposed solutions from the inventors, and turns promising ones over to the military agencies.

Smathers Introduces New Retirement Bill

A significant development in the campaign for enactment of a self-employed retirement bill occurred with the introduction of the measure in the Senate by Senator George A. Smathers of Florida. The Smathers bill is the same as



Senator Smathers

that which passed the House (Keogh-Simpson bill) except that the benefit plan would not become effective until 1961. The change is to offset the problem of revenue loss in a tight national budget picture at the present time.

Although similar bills had been introduced previously in the Senate, the special importance of the Smathers introduction is that he is a member of the Senate Finance Committee, which has jurisdiction of tax legislation. Under the Smathers-Keogh-Simpson plan, self-employed professionals and others would be permitted to invest up to ten per cent of net annual earnings (with a $2500 limit) in a retirement fund. The amount invested would be deducted from taxable income, but would be subject to tax upon withdrawal of the retirement benefits starting at age sixty-five.

"Under the present Federal tax structure, it is clear that preferential income tax treatment is given those wage-earners and salaried employees whose employers have set up qualified pension or profit-sharing plans in their behalf," Senator Smathers said in offering his bill. "Millions of our self-employed citizens today are looking to this Congress to give them the equivalent tax treatment which others are presently enjoying so that they too may be able to provide for the twilight years of their lives. Granting to them tax equality is an investment in the future of America which we in the Congress can ill-afford to ignore," the Florida solon added.

Robert C. Vogt, NSPE representative to the American Thrift Assembly, coordinating body for the professional and business associations supporting the bill, hailed the Smathers bill and statement and wired congratulations to Senator Smathers. Mr. Vogt called upon all self-employed consulting engineers to back the Smathers action with wires and letters to their own Senators, urging them to back the Smathers-Keogh-Simpson bipartisan bill. "For the first time since our efforts started we have a bill sponsored by a member of the Senate Finance Committee," Mr. Vogt said. "We must now combine that development with the recent House passage of the bill and bring our joint campaign to a successful conclusion in this Congress," he said.

NSPE's Fourth Salary Survey Ready in July

NSPE's fourth biennial Income and Salary Survey is rapidly nearing completion and will be ready for distribution by July 1, according to Society officials.

The number of persons surveyed and the large amount of replies indicate that the 1958 Survey will be bigger than any of the three previous reports. The surveys have become standard references for Government agencies, private industry, and other groups.

The July issue of the AMERICAN ENGINEER will carry a story on some of the material contained in the 1958 Survey as well as an order form giving prices, etc.

"Mind opening your back door for a minute, buddy?"

ASTM Annual Meeting Scheduled June 21-26

The education of the engineer in the materials sciences, the use of isotopes in metals analysis and testing, basic research, and an open forum on standardization of materials for nuclear reactors will be features of the 62nd annual meeting of the American Society for Testing Materials at Chalfonte-Haddon Hall, Atlantic City, N. J., June 21-26.

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NSPE Protests Federal Per Diem Rate for Consultants

A $50 per day limitation on consulting engineering fees for Federal Government projects and a proposal that engineering and design costs for such projects not exceed five per cent of the total cost have been protested to the House and Senate Appropriation Committees by NSPE.

Arthur M. Gompf, secretary of the National Society's Functional Section for Consulting Engineers in Private Practice, told members of the House Defense Appropriations Subcommittee that the existing per diem limitation of $50 is "neither adequate, reasonable nor fair; nor does it properly insure that the best interests of the Government will be protected."

Mr. Gompf, a partner in the consulting engineering firm of Egli & Gompf, Baltimore, Md., testified that "it is not economically feasible to perform professional engineering services for less than $100 per day. The net result of a Federal limitation less than this amount could very well be that the most-qualified engineers would be unable to undertake engineering projects for the Government."

Mr. Gompf's testimony cited recent statutes creating the National Aeronautics and Space Administration and the Federal Aviation Agency as recognizing the need for adequate per diem compensation in that they contain provisions for permitting a maximum per diem allowance of $100.

In a letter to Senate Appropriations Committee Chairman Carl Hayden, the National Society's executive director, Paul H. Robbins, stated that the five per cent limitation placed on engineering and design costs in the House-passed Interior Department appropriation bill for the coming fiscal year is a restriction that "ignores the practical conditions which actually exist in the consulting engineering field."

Mr. Robbins termed the measure "an arbitrary limitation regardless of the size and complexity of the project involved, contrary to basic considerations in the setting of reasonable and fair engineering fees."

The executive director advised Senator Hayden that "experience has shown that the most equitable fee arrangements for both the Government and the consulting engineer are arrived at through negotiation based on generally-accepted state and local schedules of engineering fees."

Mr. Robbins stated that if Congress feels that a statutory limit must be established, it should not include preliminary planning and estimates, preliminary surveys, economic feasibility studies and advance planning. "Instead," he said, "the fee limitation should be extended to include only the preparation of design plans and specifications, supervision of construction, inspection, and such resident engineering as may be required."

Lawrie Receives Award

Ritchie Lawrie, Jr., partner in the firm of Lawrie & Green, architectural-engineering firm in Harrisburg, Penna., received the ACES "Fifth Annual Award For Outstanding Service To Competitive Enterprise" presented by the Central Pennsylvania Chapter of ACES (Americans for the Competitive Enterprise System, Inc.) at a joint meeting of ACES and the Rotary Club of Harrisburg in the Ballroom of the Penn Harris Hotel recently. Edgar Z. Wallower, left, president of the Central Pennsylvania Chapter of ACES, is shown presenting the award to Mr. Lawrie, center, while Melvin J. Freeman, ACES executive director, looks on.

Wage-Hour Coverage Extended in Ruling

In a follow-up decision based on the Supreme Court's opinion in the *Lublin, McGaughy* case, a Federal district court in Pennsylvania has ruled that the nonprofessional employees of a Dillsburg, Pennsyl-

vania, consulting engineering firm are subject to the provisions of the Wage-Hour Act. The Government's complaint against the firm, Capitol Engineering Corporation, was filed over a year ago, but the court's decision was held in abeyance awaiting the ruling of the Supreme Court in the *Lublin, McGaughy* case.

Capitol Engineering Corporation is engaged primarily in highway work, although the scope of its operations includes airports, municipal water and sewer plant designing, and some factory work. In relation to the highway work, the firm's employees go into the field, take traffic counts, make a survey of the terrain and combine these findings in a report indicating a proposed route together with reasons, economically and trafficwise. Subsequently, the firm's employees make a detailed survey of the route and prepare plans and specifications for the project. These plans, specifications, and blueprints are then shipped to the State Highway Department so that it can solicit bids for the work. The data and information obtained by the survey parties in the field are sent to the firm's office in Dillsburg, and the bulk of the work incident to the preparation of detailed plans and specifications is performed there.

The Government maintained that the making of preliminary surveys, plans and specifications for improving highways constitutes an engagement in commerce, and that the sending of data obtained by survey parties across state lines and the shipping of plans, specifications and blueprints across state lines also amounts to being engaged in commerce.

On the basis of the *Lublin, McGaughy* decision, the district court agreed with the Government's contentions and ordered the firm's nonprofessional employees engaged in making preliminary surveys and soil tests, preparing plans and specifications and surveying and staking out improvements and extensions of interstate highways to be paid in conformity with the requirements of the Act. (*Mitchell* v. *Capitol Engineering Corporation*, Civil No. 5445, U. S. District Court, Middle District of Pennsylvania). *See related story on page 35.*

ARBA Board Formulates Policy Statement

A formal "Statement of Policy" which sets forth in detail the position of the American Road Builders' Association with regard to the use of consultants by state highway departments has been approved by the Board of Directors of ARBA's Engineering Division.

While the text of the statement was not released, pending final approval by the ARBA board, spokesmen for the association said that no change in ARBA policy is proposed. The statement is intended only to clarify and more closely delineate ARBA's position regarding consultants. The association has many times recommended the use of consulting engineers to supplement highway department staffs during periods of peak work loads and for specialized assignments. A major part of the Engineering Division's effort has been concerned with describing the scope of highway consulting work, setting up fee criteria, and establishing procedures for the effective use of consultants in highway engineering work.

Three new committees were activated at the board meeting in Washington:

1. A Committee on Public Relations, headed by Mason Lockwood of Lockwood, Andrews and Newnam, Houston, Tex.

2. A Committee on Prequalification of Engineers, with W. H. Corddry of Gannett, Fleming, Corddry & Carpenter, Inc., Harrisburg, Pa., as chairman.

3. The engineer half of a Joint Contractor - Consulting Engineer Committee, which has been set up to consider mutual problems. T. Carr Forrest of Forrest and Cotton, Dallas, Tex., is the engineers' co-chairman.

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Five Seniors Named Winners Of NSPE-Armco Scholarships

- Each Student to Receive $750 Per Year
- Civil Engineering is Field of Study

Civil engineering scholarships have been awarded to five high school seniors in a nation-wide scholarship selection program sponsored by the Armco Foundation, in cooperation with NSPE.

The four-year, $3,000 scholarships were awarded by a selection committee made up of representatives of the National Society and Armco Drainage & Metal Products, Inc., a subsidiary of the Armco Steel Corporation. The awards were granted on the basis of the students' scholastic records and aptitudes for engineering.

The five scholarship winners are: Leslie Ray Hill, Route 1, Spencer, N. Y.; Marvin C. Beasley, 912 West Mauney, Gastonia, N. C.; Malcolm M. Rea, 4231 W. 15th Avenue, Amarillo, Texas; Raymond Arthur Beazley, 303 E. Main, Arcola, Illinois, and Dale Lewis Schwarzhoff, 1210 S. Owyhee, Boise, Idaho.

Each scholarship winner will receive $750 per year from the Armco Foundation, an educational and charitable organization established by the Armco Steel Corporation. The scholarships will be renewed annually for four years providing the student meets satisfactory personal and scholastic standards as determined by the college in which he is enrolled. The five youths may attend any college or university of their choice providing it is accredited by the Engineers' Council for Professional Development.

Privately endowed schools in which scholarship winners are enrolled will receive an unrestricted grant of $500 annually from the Armco Foundation. The grant is a cost-of-education allowance paid each year the scholarship is in force. Tax-supported colleges will receive a yearly allowance of $100.

The five civil engineering scholarships will be awarded each year by the Armco Foundation for outstanding graduates of public, private, and parochial schools throughout the United States. Applicants must rank in the upper one-fourth of their high school classes and plan to study civil engineering.

Scholarship Winners

Here are three of the five winners selected for scholarships in the Armco Foundation-NSPE program—Raymond Arthur Beazley, left, Marvin C. Beasley, center, and Leslie Ray Hill.

ASEE Annual Meeting Scheduled June 15-19

Engineering education will be carefully examined when more than 2000 members attend the 1959 annual meeting of the American Society for Engineering Education in Pittsburgh, June 15-19. The University of Pittsburgh and Carnegie Institute of Technology are co-hosts.

The five-day meeting will have a two-fold focus:

- For an entire day, engineering educators will be the guests of industry in the greater Pittsburgh area to observe operations and problems and to see how engineering college graduates fit into their new environment.

- In papers throughout the meeting, attention will be centered on increasing the effectiveness of engineering education to meet the needs of graduates in professional careers which will extend over the next forty-five years. This will include the relationship of the basic sciences to engineering; methods of developing more and better teachers; the basic processes of learning in engineering, and future needs of the profession which the ASEE must meet.

JETS Say Engineering Taking 'Back Seat'

Overemphasis on rockets and some phases of science has "romanced" young talent from engineering, according to the national Junior Engineering Technical Society (JETS).

R. E. Britner, vice president of the Keuffel and Esser Company, Detroit, Mich., who was named chairman of the board at its recent meeting at Michigan State University, declared that although there are ten times as many engineers as scientists, engineering has taken a "back seat" and "we are

attempting to put engineering back into its proper focus."

"When a rocket is fired, it is not only science but also engineering," he explained. "Science alone is not going to improve the standard of living. We have to have engineers to put scientific knowledge to work."

The board, composed of leading figures in industry, government, and education, appointed working committees to step up efforts toward the advancement of engineering and the physical sciences at the high school and junior college levels.

NSPE Executive Director Paul H. Robbins has been named to the Executive Committee of the board.

$300,000 Donated for Professional Development

The trustees of Newark College of Engineering, Newark, N. J., have announced that a Newark industrialist, Thomas M. Cole, president of Federal Pacific Electric Co., has donated $300,000 to the college for the establishment of a research foundation to assist the professional development of its graduate students and faculty instructing staff.

In commenting on the trustees' announcement, Dr. Robert W. Van Houten, president of NCE, stated that the program will have as its three main objectives the creation of opportunities for the professional development of the teaching staff by providing them with broadly fundamental research activities in science and engineering; the attraction of capable young engineering graduates to the engineering teaching profession by offering them a combined program of education, teaching, and research, and the development of programs at the college to assist secondary school teachers of science and mathematics in their own professional advancement.

It is in other words, the educator said, a program which will use research not as an end in itself, but as a means of improving the qualifications of teachers and graduate students.

Honor Students Rewarded in Mass. by Scholarship Fund

Math and science honor students from the Greater Lynn, Mass., area are being rewarded for their scholastic efforts through a unique scholarship fund which all began with a "Letter to the Editor."

In December of 1957, an article appeared in *The Lynn Item* concerning a financial drive to send the Swampscott (Mass.) High School's championship football team on a trip to Miami and Washington. To Mr. H. E. Crabtree, a

H. E. Crabtree

General Electric engineer, this was a matter of deep concern.

He wrote a letter to the newspaper in Lynn. It said in part: "How much better timed would be a collection to send all of the honor students with A's in math, physics and chemistry to witness a rocket firing at Cape Canaveral, or to provide two well-deserving, properly oriented students with a four-year college education in engineering or science."

The Item had contributed $150 toward sending the football team on its trip; Mr. Crabtree challenged the newspaper to match this amount in a fund to reward worthy math and science students. The *Item* agreed, provided Mr. Crabtree put up a similar amount. He did—and *The Item*-Crabtree Science Scholarship Fund was established.

Mr. Crabtree, who is manager, Engineering Administration, Instrument Department, of the GE West Lynn Works, raised his share of the money mainly through contributions from fellow engineers at GE.

The money was forwarded to Paul H. Wilson, president of the North Shore Chapter, Massachusetts SPE. The Chapter served as administrators of the fund. Rather than provide scholarships for a few students, it was decided to hold trips to points of scientific interest.

As interest grew in the program, further contributions were made. Every contribution reported by Mr. Crabtree was matched by *The Item*.

Finally, in May of last year, thirty-five science students from junior and senior classes took a trip to General Electric Company's Research Laboratory in Schenectady, N.Y. Principals in seven Greater Lynn high schools selected five students from each school to make the tour. More than $600 had been contributed to the fund at the time of the trip.

Upon their return, the students wrote reports on what they had observed during the trip. Two students were awarded $50 savings bonds by *The Item* for the best reports.

Another trip to the GE laboratories was planned for this year. With the program a success, Mr. Crabtree requested that his name be withdrawn from the fund and it be known as "*The Item*-Engineers Science Scholars Fund."

The board of directors of the North Shore Chapter, MSPE, and *The Item* worked jointly on the project. An anonymous gift of $500 plus a $37.50 contribution from one of the students who made the trip in 1958 started off this year's campaign in fine fashion.

This year's trip was scheduled for May 26-27, with thirty-two students touring the GE facilities in Schenectady.

Now Available . . .

Standard Contract Forms Covering Engineer-Architect and Architect-Engineer Agreements

Standard Forms of Agreement are now available after many years of effort by NSPE's Interprofessional Relations Committee to develop suitable contract documents for use when both architects and engineers are working jointly on a project. Six Forms have been prepared, three where the engineer is principal and three where the architect is principal. The documents are primarily guides and need not be used exactly as prepared.

A complete kit with the set of six Forms plus explanatory material is available for $1. Additional copies of the individual Forms are available at the following rates: 1-25 copies, 20c each; 26-100 copies, 15c each, and over 100 copies, 10c each.

Agreement between Engineer and Architect on Percentage Basis . . . Form No. 2

Agreement between Engineer and Architect on Basis of a Multiple of Direct Personnel Expense . . . . . Form No. 3

Agreement between Engineer and Architect on Basis of a Professional Fee Plus Reimbursement of Expenses . . . . . Form No. 4

Agreement between Architect and Engineer on Percentage Basis . . . Form No. 5

Agreement between Architect and Engineer on Basis of a Multiple of Direct Personnel Expense . . . . . Form No. 6

Agreement between Architect and Engineer on Basis of a Professional Fee Plus Reimbursement of Expenses . . . . . Form No. 7

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Tau Beta Pi Announces Fellowship Winners

Five young engineers have been selected by Tau Beta Pi, national engineering honor society, for graduate fellowship awards in 1959-60.

Named as winners were: Jerry M. Mendel, Flushing, N. Y.; George K. Bienkowski, Albany, N. Y.; Philip R. Austin, New Rochelle, N. Y.; Kenneth E. Harwell, Wetumpka, Alabama, and Gerald P. Lahti, Clawson, Michigan.

These five awards by Tau Beta Pi's Fellowship Board brings the total of 152 fellowships granted since the program was started in 1929. Stipends for this group are $1,500 each for the nine-month academic year.

Serving on the board are: NSPE Executive Director Paul H. Robbins, director of fellowships for Tau Beta Pi; Ralph S. Healy, retired engineer, formerly with the New York Telephone Company, New York, N. Y.; Joseph C. Wagner, supervisor of industrial relations, The Texas Company, Beacon, N. Y., and Emanuel A. Salma, assistant dean in charge of the evening division, New York University, New York, N. Y.

Role of Engineering Technician Discussed

The United States will suffer an increased lack of important technical manpower unless the role of the "engineering technician" is better understood and appreciated by education and industry.

This was the message of G. Ross Henninger, president of Ohio College of Applied Science, Cincinnati, Ohio, at the annual meeting of the Michigan Section, American Society for Engineering Education.

"In the present national economy," said Mr. Henninger, "there is a confirmed need for qualified and properly prepared technicians in engineering and related technologies which numerically exceeds the much-talked-about need for scientists and engineers."

Classification Legislation Opposed by Administration

Legislation which would establish separate classifications and pay schedules for Government engineers and scientists is being opposed by the Administration, delegates to the recent Conference on Scientific Manpower learned in Washington.

"This type of special treatment starts us in the vicious circle of professions competing with one another for pay and recognition," Rocco C. Siciliano, special assistant to the President for personnel management, told the group.

Four bills designed to set up the separate classifications are pending now in Congress. The legislation has been endorsed by the NSPE.

Mr. Siciliano criticized the proposals as "lacking flexibility" and said they included no provision for recognizing exceptional ability or outstanding performance.

Mr. Siciliano said the Administration was "acutely aware" of the inadequacies of the Federal pay structure, but said he believes the solution lies in the adoption of a uniform and comprehensive pay policy "which will provide equitable pay treatment for all employees."

Later in the session, Civil Service Commission Chairman Roger Jones indicated that there were no further pay adjustments in sight at the present for the more than 100,000 Government engineers and scientists.

"No matter how strongly the urge may come to abandon all the rules, I say that we cannot and we will not," Mr. Jones said. "The needs for scientific manpower contain no license to scrap the merit system. We can modernize it, and streamline it, and adapt it; we can cut red tape and we can cut corners; but we must maintain the basic merit principles. It is my own opinion, however, that these principles, if applied with wisdom and imagination, need not be a handicap."

Mr. Jones said the various Federal agencies could help to solve their engineering and scientific manpower problems by establishing more progressive personnel policies, better working conditions, giving employees a chance to attend professional meetings and to belong in such organizations and the opportunity to maintain professional standing through further training and studies.

Mr. Jones predicted that the Government's needs for engineers and scientists will increase by about twenty per cent by 1963. He said the Commission faced a threefold responsibility in recruiting and retaining the personnel:

"(1) The Commission must battle for establishment and maintenance of a set of employment conditions in the Federal Service which will be attractive to well qualified men and women in the various occupational fields; (2) the Commission must gear its recruitment processes to competitive effectiveness while at the same time maintaining merit system requirements and (3) the Commission must take the lead in adapting the Federal personnel system to meet special problems, such as the acute shortage of scientists and engineers which has prevailed in recent years.

Another speaker, Dr. Ralph D. Bennett, a former naval scientist and now manager of the Vallecitos Atomic Laboratory, told the conference that the Government should exploit its many natural advantages in the competition for top scientific and engineering talent.

"In providing opportunities for professional development, the Federal Government offers much that cannot be matched by industry," Dr. Bennett said. "The Government's problems are often bigger, broader, deeper, more far-reaching, affect more people and offer the possibility of doing more for the common good than most industry can offer. Industry often deals only with bits and pieces of Government programs."

Dr. James R. Killian, Jr., special assistant to the President for Science and Technology, said the Government should provide advancement for scientists and engineers without always forcing them into administrative jobs.

"While Government should provide openings for scientists and engineers at the highest rungs of the administrative ladder, a career of scientific service must also be flexible enough to allow for advancement of scientists who wish to remain in scientific work and make their contributions free from administrative responsibilities," he said.

Title Changes Affect Air Force Engineers

Several title changes have recently taken place in the Air Force affecting engineers.

The title of the Directorate of Installations of the Air Force has been changed to the Directorate of Civil Engineering. The Director of Installations is now known as Director of Civil Engineering, Headquarters, United States Air Force.

The Installations Engineer Staff Officer has become the Civil Engineering Staff Officer, and the Base Installations Officers is now the Base Engineer.

Young Industrial Engineers Need Early Responsibility

Young college engineers and scientists should be given responsibility for a specific assignment soon after they are employed by industry, a University of Michigan industrial relations expert believes.

Prof. John W. Riegel, director of the U-M Bureau of Industrial Relations, says:

"The introduction to company products and processes can be brief. Information pertaining to company organization, personnel policies, and so forth, can be presented on a part-time basis over a number of months while the new man is engaged in some practical and remunerative work.

"In this way, his ability to perform specific assignments will be tested, and so will his other important characteristics. Also he will be more fully earning his way under the usual employment conditions."

Placement experts in the U-M School of Business Administration report that many companies are now following similar training practices for recent graduates in such fields as marketing and sales.

After the engineering or science graduate becomes familiar with his company and his work, Riegel believes individual programs for self-development should be started. These will be successful only when individual motivation for continuing education and improvement of personal skill is high, he emphasizes.

Soiltest Announced Winner of PR Award

The international people-to-people public relations program carried out by Soiltest, Inc., Chicago manufacturer of engineering testing equipment, was announced as a winner of a Certificate of Achievement at the annual convention of the American Public Relations Association. The company's international public relations activity was under the direction of its president, Theodore W. Van Zelst.

During the past few years Soiltest, Inc. has carried on an international public relations activity to both support the people-to-people program and to improve communications and sales activities between the firm and its overseas markets.

The program involved meeting with hundreds of engineers, professional people, the press, and government officials in the course of the visits to discuss some of the mutual problems and advances in the field of civil engineering.

Meetings of Note

Society of Women Engineers—National Convention, June 4-7, Chase Hotel, St. Louis, Missouri.

American Rocket Society—Semi-Annual Meeting, June 8-11, El Cortez Hotel, San Diego, California.

American Society of Mechanical Engineers — Semi-Annual Meeting, June 14-18, St. Louis, Missouri.

American Society for Engineering Education—Annual Meeting, June 15-19, Carnegie Institute of Technology and University of Pittsburgh, Pittsburgh, Pennsylvania.

Institute of the Aeronautical Sciences—National Summer Meeting, June 16-19, Hotel Ambassador, Los Angeles, California.

American Society of Agricultural Engineers—Annual Meeting, June 21-24, Cornell University, Ithaca, New York.

American Society for Testing Materials—Annual Meeting, June 21-26, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

American Institute of Electrical Engineers—Summer General Meeting, June 21-26, Seattle, Washington.

Buffalo Engineers Vote For Same Union Again

Following the Supreme Court decision in the *Kyne* Case, holding the NLRB's inclusion of nonprofessional employees in a professional unit to be invalid, the Board set aside its previous certification of the Buffalo Section, Westinghouse Engineers Association, ESA, and ordered a new election. The engineers subsequently voted for representation by the same union, 188 to 93. In the 1956 election, the vote for the union was 126 to 80.

The two dissenting Supreme Court Justices in the *Kyne* Case expressed the concern that permitting court review of the NLRB decision would open the door to court review of all representation determinations. The first attempt to use the *Kyne* Case decision for this purpose has been rebuffed by the district court. The court refused to allow review of a Board determination of the supervisory status of certain employees because it is well-established that courts do not have jurisdiction to review representation proceedings of the Board, the *Kyne* Case being the exception to the general rule. The district court noted the basic difference in the two cases—in *Kyne* the Board had violated a specific prohibition upon its powers, whereas, "in the instant case the applicable section of the Act allows the exercise of administrative judgment on the part of the Board." (*Connecticut Light & Power Co., v. Leedon*, U.S. Dist. Ct., D.C., No. 2822-58)

Canadians Concerned Over Advertising

Officials of Canadian professional engineering associations have noted concern over large-scale advertising for engineers in Canadian publications even though it is indicated that in many cases the company is not in the market for additional engineering personnel.

T. M. Medland, executive direc-

tor, Association of Professional Engineers of Ontario, commented after a recent reported incident: "Many of us have noted this big advertising approach by U.S. firms, even when the companies concerned were known to be laying off engineers. It could be a tax-free method of advertising the company." Meanwhile, it is reported that many engineers in Canada are unemployed and plan to emigrate to other countries.

Westinghouse Conducts Personal Follow Program

What factors contribute to the success of a young engineer? A year's experience with a "Personal Follow Program" conducted by Westinghouse Electric Corp. and participated in by 1,200 engineers with experience ranging from one to six years, indicates that the important factors are: spatial vision, advanced engineering, and quantitive ability. G. E. Moore, manager of graduate student training for Westinghouse, presented the findings at the winter general meeting of AIEE in a paper on "1200 Case Studies of Engineering Motivation."

Eighty-nine per cent of the 1,200 "have 'Spatial Visual Scores' some 175 points above the national mean," he said. "This would indicate a rather high ability to translate the spoken word, analytical terms, ideas, etc., into 3-dimensional mental images ultimately leading to realistic devices. The 'Advanced Engineering Scores' of the entire group were some 100 points above average, whereas in 'Quantitive Ability' this difference was 133 points. This would seem to indicate that Engineering Ability and Engineering Analysis are also keys to success in this area . . . this is by no means conclusive. However, we are optimistically hopeful that continuing analysis of the data we are collecting will help us improve our program of selection, training and placement."

The program has uncovered, so far, "some twenty to thirty young men showing exceptional promise," he said.

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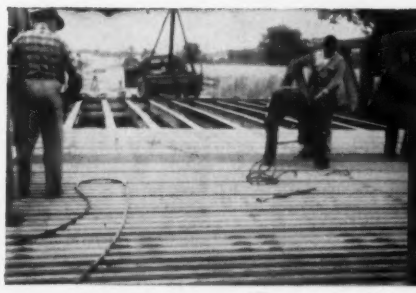

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Engineering Statute Held Constitutional in Oregon

A challenge to the constitutionality of the Oregon Engineering Registration Act on the ground that it constitutes an unlawful delegation of authority to the State Board, and that it is too vague and uncertain to afford a basis for a charged violation, was overruled recently by an Oregon District Court.

The case arose when the defendant, a corporation, was accused of the crime of unlawfully and willfully advertising to practice professional engineering without being authorized by law to engage in such practice. The defendant firm had advertised itself as being competent and qualified to perform design services, estimates, supervision and construction in connection with woodworking plants, sawmills, planing mills, wood rooms and barking and chipping installations. Under Oregon law, corporations may practice engineering so long as the person or persons in responsible charge of the work are registered professional engineers. Neither of the two persons in responsible charge of the defendant firm's operations were licensed.

The defendant answered the complaint by moving to dismiss the action on the ground that the Oregon statute, in providing that the type of examination and the methods of procedure shall be prescribed by the board, failed to set out in precise terms the scope and character of the examination. This language, the defendant claimed, amounts to an unconstitutional delegation of legislative power to the board, and, in effect, confers upon the board an arbitrary power to exclude applicants from the practice of engineering.

The court disagreed, however, and relied upon the general rule that the police power of the state to provide for the public safety and general welfare of its people authorized it to prescribe such legislation "as will secure or tend to secure them against the consequences of ignorance, lack of skill and even fraud and deception."

The court added that "the discretion here granted to the examining board to determine the applicant's subject knowledge, degree of skill, and methods of procedure to be followed in conducting the examination is administrative, and within the limits of our State and Federal Constitutions."

"The nature and character of the profession, trade or calling intended to be licensed or regulated," the court concluded, "often requires technical knowledge which, in the nature of things, may be outside the wisdom of the legislature."

In further support of its attempt to dismiss the proceedings, the defendant alleged that the statute is too vague and uncertain to sustain a criminal charge on the ground that the portion of the statute that states that an applicant cannot be admitted to an examination unless "he has had charge of engineering work, as principal or assistant, for at least one year," is inconsistent and contrary to that portion which declares that "no person shall practice or offer to practice or advertise professional engineering unless he is registered."

In answer to the "vague and uncertain" contention, the court declared that the apparent inconsistency must be read in conjunction with other sections of the statute, particularly that which exempts from the statute individuals (1) working for the United States Government, (2) working under the direct personal supervision of another registered engineer, or (3) working for another individual, firm or corporation practicing professional engineering on property which it owns, leases or in which it has an interest. Individuals in the above-three categories, the court concluded, may obtain qualifying experience without being accused of practicing engineering without a license.

Accordingly, the court overruled the defendant's motion to dismiss, and instead ordered the case set for trial. *(Oregon v. Thompson & Holmberg, Inc.,* No. 64488, Oregon District Court, Multnomah County.)

Meeting in Missouri

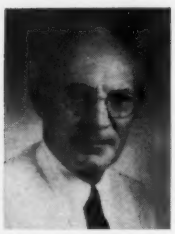
Members of the Missouri SPE and the State Registration Board are shown at a recent meeting. Seated, l-r., are: A. L. McCawley, Board counsel; J. K. Roberts, Society secretary; W. E. Bryan, Board member; Mrs. Clemmie Wall, Board secretary; C. W. Schemm, Society vice president; Bruce Williams, Board chairman; H. O. Croft, Society president; Paul N. Doll, Society executive secretary; Frank Beard, Board member; A. V. Ferry, Society president-elect, and W. P. Salisbury, Society treasurer.

Strictly Business

Personalities . . . Major promotions in the engineering departments of **The Garrett Corporation's** AiResearch Manufacturing divisions in Los Angeles, Calif., and Phoenix, Ariz., have been announced. In Los Angeles, **James V. Crawford** has been appointed chief engineer and **Norman M. Brown** assistant chief engineer. In Phoenix, **Dr. Helmut Schelp** has been named chief engineer and **Carl Paul** assistant chief engineer. . . **Ellery W. Stone,** president of **ITT Communication Systems, Inc.,** Paramus, N.J., has announced the appointment of **Rodney D. Chipp** as director of engineering . . . **Donald V. Brown** has been appointed manager-sales development for the Silicone Products Department of the **General Electric Company,** Waterford, N.Y. . . . **Bernard Johnson & Associates,** Houston, Tex., announce the addition to their staff of **David J. Engel** who will assume the duties of chief structural engineer . . . **Al Thurman** has been named president of **The Lombard Manufacturing Company** and vice president of **Lombard Corporation,** with headquarters in Youngstown, Ohio.

Mr. Crawford

Alwin B. Newton, director of engineering for the York Division of **Borg-Warner Corporation,** York, Pa., has also been named a vice president of the company . . . **Kendall C. White** has succeeded **Emil F. Gibian** as director of industrial engineering at **Thompson Ramo Woolridge Inc.,** Cleveland, Ohio . . . **The Panama Canal Company,** Canal Zone, has announced the appointment of **Elmer B. Stevens** as resident engineer for the construction of the bridge over the Panama Canal at Balboa . . . **Jack C. Hoagland** has been named director of engineering at **Daystrom Pacific,** Los Angeles, Calif. . . . **Martin J. Dempsey** has been appointed product metallurgical engineer in the **Crucible Steel Company's** Technology Department, Pittsburgh, Pa. . . . The appointment of **Edgar K. Wimpy** as manager of marketing research for **CBS-Hytron,** a division of **Columbia Broadcasting System, Inc.,** has been announced . . . Several promotions have been announced by **Melpar, Inc.,** Falls Church, Va., a subsidiary of **Westinghouse Air Brake Company.** The men and the new positions are as follows: **F. J. Drummond,** employment manager; **H. W. Mauldin,** project engineer; **David Lee,** project engineer-in-charge; **J. C. Haltiwanger,** project engineer; **H. M. Burns,** project engineer, and **F. H. Jaynes,** consulting project engineer.



Mr. Stevens

M. H. Cutler has been named engineering manager of **Stone & Webster Engineering Corporation,** Boston, Mass., and New York, N.Y. In other changes, **Thomas A. Fernside,** chief mechanical engineer, was made assistant engineering manager. **Floyd F. Dedrick,** assistant chief mechanical engineer, was named to succeed **Mr. Fernside** . . . The election of **Raymond Mirrer** as vice president of **Strato-Missiles, Inc.,** New York, N.Y., has been announced . . . **George F. Zimmerman** has been appointed project engineer in the Power Section of **Allied Chemical's Barrett Division,** New York, N.Y., it has been announced by **A. J. Barchi,** director of engineering . . . **Arnoux Corporation,** Hollywood, Calif., has named **Donald J. Gimpel** as director of engineering . . . **George Ustin** has been appointed to the newly-created post of vice president in charge of engineering at **Buchanan Electrical Products Corporation,** Hillside, N.J. . . . The appointment of **George F. Breitwieser** as chief engineer, West Coast Missile and Surface Radar Department, **Radio Corporation of America,** has been announced . . . **Charles Nater** has become chief engineer of the Instrument Division of **Beckman & Whitley, Inc.,** San Carlos, Calif.

Mr. Mirrer

Robert R. Donaldson, board director and vice president in charge of engineering for **Hagan Chemicals & Controls, Inc.,** has retired after more than forty years with the Pittsburgh, Pa., firm . . . **Bohn Aluminum & Brass Corporation,** Detroit, Mich., has announced the promotion of two product engineers. **Herbert S. Lindahl** has been promoted to chief product engineer-refrigeration, and **Gordon Kayser** has been made chief product engineer-heating and air conditioning . . . **Charles D. Wood** of **Worthington Corporation's** Boston, Mass., district office has been appointed office manager . . . **Thomas R. Reagan** has been named a field engineer for the **Denison Engineering Division, American Brake Shoe Company,** Columbus, Ohio . . . The appointment of **Col. W. Dixon Smith,** USA (ret.), to the position of staff hydraulic engineer of **The Asphalt Institute,** College Park, Md., has been announced . . . **Jaime Iragorri** has joined the Engineering Department of **Maule Industries, Inc.,** Miami, Fla. . . . The appointment of **B. Raymond Sayer** as manager of **The Austin Company, Limited,** with offices in Montreal and Toronto, has been announced . . . **James R. Fraser** has been named director of engineering for the **Theo. Hamm Brewing Company,** St. Paul, Minn.

Mr. Wood

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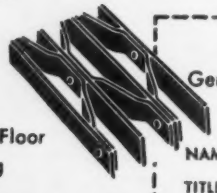

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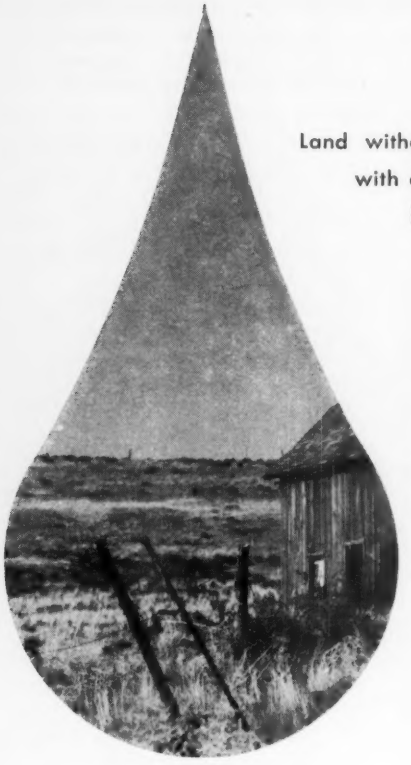
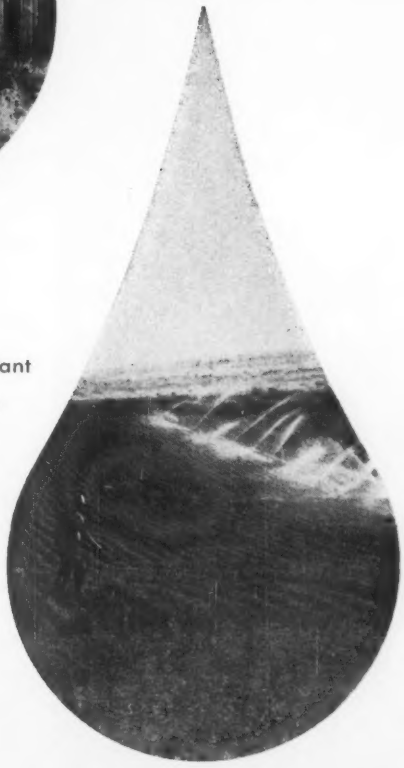
ENGINEERS TURN TO SEAS FOR A NEW WATER SUPPLY



Land without water. Now comes hopes with engineers tapping the seas and brackish areas.



Near deserts turned into verdant land with water once more available.

WATER covers nearly three-fourths of the earth's surface. Yet, huge areas of the world face economic stagnation because of the lack of this vital resource.

Today, thanks to rapid engineering advances, this age-old enigma may be nearing a solution. The possibility of converting the world's inexhaustible supply of salt water into a usable human commodity has intrigued man for years. But desalination on a large scale—large enough to meet the needs of enormous population and industrial concentrations—has been stymied by one big factor—cost.

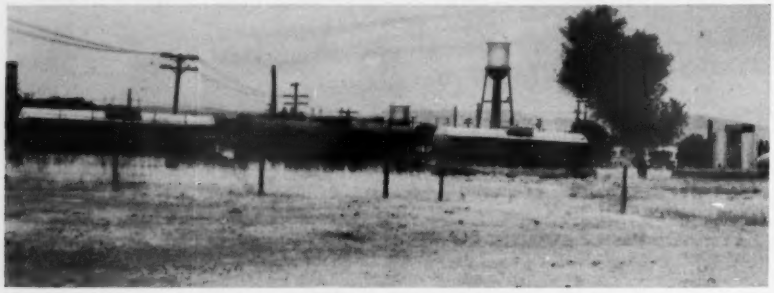
Recent improvements in techniques have raised hopes that this economic barrier may at last be overcome. A number of commercial and industrial firms and at least one municipality are already making use of water which has been converted either from the sea or from inland brackish reservoirs. Now the big challenge is to extend these processes to the point where huge masses of sea water and brackish water can be made potable at a reasonable cost.

The possibilities which such an accomplishment would hold for the water starved areas of the world are almost endless. Secretary of the Interior Fred Seaton believes successful completion of the program will mark "one of the major scientific breakthroughs of all time."

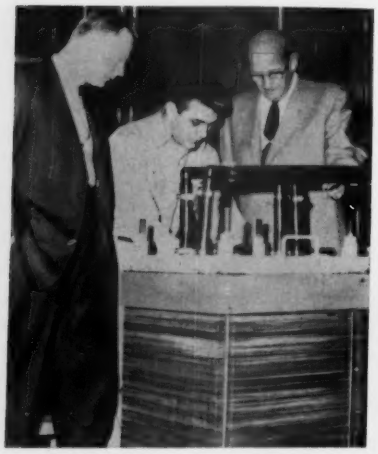
Mr. Seaton's remarks may be regarded by some as overly optimistic, but no one denies the critical state of the world's fresh water resources. Increasing populations accompanied by phenomenal indus-

An abandoned farmhouse and a motionless windmill stand as stark testimony to nation's water problems.

Successful conversion of saline water may eventually turn these drought-plagued lands into productive agricultural areas like this irrigated farm. Desalination also holds out big hopes for the successful solution to many municipal and industrial water problems.



Water tank cars make their last trip to Coalinga, Calif. The city now is producing its own fresh water by use of an Ionics electric membrane desalting plant. Before installation of the plant, the city was paying $7.05 a thousand gallons to have the water shipped in by railroad tank cars. It is now producing a plentiful supply for about one-seventh of that cost.



Coalinga's mayor and city manager inspect one of the four Ionics' membrane stacks of the nation's first municipal desalting plant—l.-r.: City Manager Walter Barham; Ionics field engineer Theodore Papastavros, and Mayor Joseph Steele.

An experimental long-tube vertical distillation plant at Harbor Island, North Carolina. The Office of Saline Water in the Department of Interior has selected the method for testing in one of five demonstration plants to be built by the Government.

trial developments have placed terrific demands on already limited supplies. Today many areas suffer extreme hardship and economic retardation simply because of the lack of adequate water.

The U. S. is considered a relatively "water rich" country, but demands are increasing by leaps and bounds each year. In 1900, the country required only forty billion gallons a day. Now it takes 240 billion g.p.d. to provide the minimum needs. By 1980, this figure is expected to rise to nearly 600 billion g.p.d. And, as the demand skyrockets, the known supplies of fresh water are being rapidly depleted in many areas.

The U. S. Geological Survey, in a recent report, made this fact quite plain:

"The number of areas in which undeveloped supplies of fresh water are available has diminished considerably with the rapid growth of industries and population in the past decade. Many areas previously considered to have relatively unlimited water resources have reached the point at which water shortages either exist or are threatened."

As many communities are painfully aware, industrial development is impossible where there is not plentiful supplies of relatively low-cost water. It takes 660,000 gallons just to produce a ton of synthetic rubber; 75,000 gallons to turn out a ton of high grade paper, and

65,000 gallons to produce a ton of cold rolled steel. The geographical distribution of the United States' industry and population—22 of the states bordering the coast contain 65 per cent of the industry and 55 per cent of the population—make the salt water conversion program particularly important to this country.

Recognizing the possibilities of the program, President Truman in 1950 instructed the Secretary of the Interior and the heads of other Federal agencies to collect information on the various projects and seek legislation for research and development. The result was the establishment of the Office of Saline Water in the Department of Interior in 1952. Since that time the office has carried out the program through research grants and contracts with various firms, engineers, chemists, physicists, and educational institutions.

THE entire program is moving rapidly out of the laboratory stage. The Office of Saline Water now is preparing to construct five big demonstration plants to give some of the more promising conversion processes a full scale test. Meanwhile, private firms, operating independently from the government program, are moving ahead with research on new methods and the development and improvement of already established processes.

The OSW already has selected a multiple effect distillation process for the first demonstration plant which will be constructed on one of the sea coasts. Four other processes—two for sea water and two for brackish water—are to be selected later. The sea water plants are to be located on the east, west and Gulf coasts. One of the brackish plants will be built in the Northern Great Plains and the other in the Southwest. The demonstration plant program, the biggest single development since the Federal office was established, was authorized $10 million by the last session of Congress.

It is hoped that out of this program will come the answers to the big questions—which processes are most feasible and how cheaply can they produce potable water? The cost factor—the critical question in the whole program—is often difficult to pin down amidst conflicting claims.

At the present the OSW is talking in terms of converting sea water for slightly less than $1 a thousand gallons—about the cost of bottled water. Dr. A. L. Miller, newly-appointed director for the saline office, holds out hopes that the cost can be reduced to about fifty cents within the next 10 years. The cost reduction may come sooner, possibly within the next four to five years, if a major scientific breakthrough can be accomplished, Dr. Miller says. The cost of converting inland brackish water varies greatly depending on the saline-content of the particular reservoir. The OSW is reluctant to quote a definite figure on brackish water, saying only that the cost will be less than that required for the conversion of sea water.

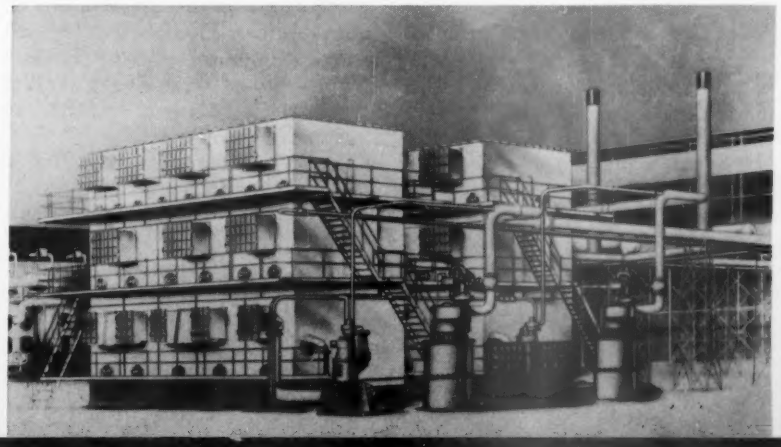
In the past, many of the OSW figures have been more conservative than the cost estimates brought forward by the promoters of some of the processes. Many of these lower estimates, the OSW contends, include only a portion of the costs of conversion. The OSW, itself, has taken a careful approach to the cost problem and has attempted to include all conceivable factors—costs of energy, equipment, operation and of the amortization of the plant investment. The figures, however, do not include the distribution system costs.

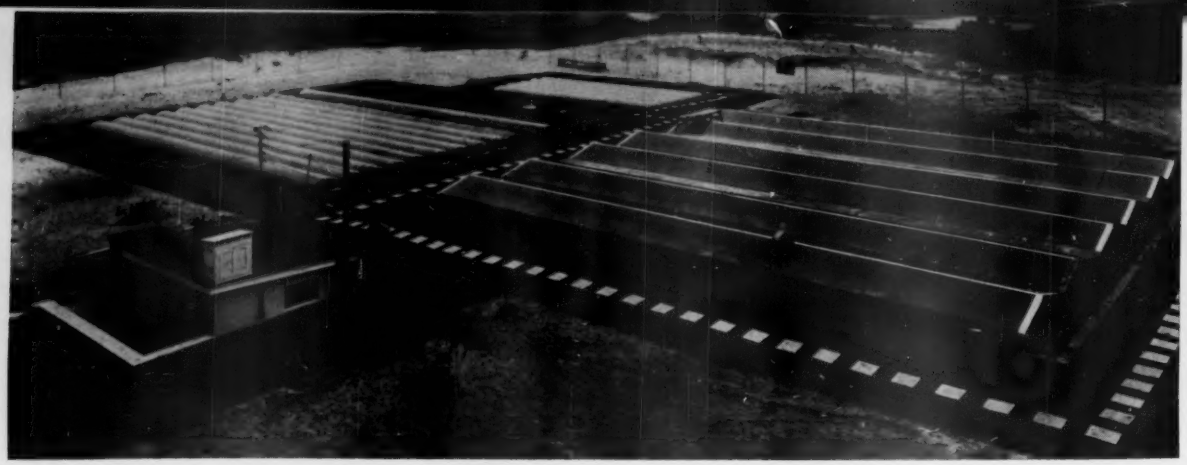
The value placed on converted saline water, of course, will vary greatly according to the needs of the different areas. It is obvious that a gallon of water is much more valuable in an arid semi-desert region than it is in a lush water-rich area. The variety of yardsticks used in computing water costs make it extremely difficult to draw an accurate picture of the competitive status of converted water.

Water rates nation-wide average out to between thirty and thirty-five cents a thousand gallons, considerably less than the current conversion costs listed by the OSW. But the OSW contends this is not a fair comparison, since many of these fresh water costs are based on figures in use when plants were built ten to twenty years ago. The true comparison, the OSW believes, will come when a community has to go out and seek a brand new source of fresh water at present-day costs. And it may well be that many of these communities will decide to install conversion plants rather than to build expensive dams and related facilities needed to bring fresh water from long distances.

CONVERTED water already is on a competitive footing in many water short areas of the world. In the U. S. alone more than sixteen million gallons of converted water are being produced daily. One of the big milestones in the program was recorded in February when the City of Coalinga, Calif., opened the first municipal desalting plant in the U. S. The plant—an Ionics electric membrane unit—is now remov-

Artists' conception of a Weir multi-flash sea water evaporation plant now under construction in Kuwait. When completed in 1960, the plant will provide 2,250,000 gallons of fresh water from the sea daily.





Solar stills being tested at Port Orange, Fla., for possible use in desalting sea water. This method has a free source of energy—the sun—but high capital costs for the plant and equipment are holding back its development. The stills are one of a number of facilities being tested by the Office of Saline Water.

ing 400 pounds of salt daily from 28,000 gallons of well water at a cost of about $1.10 a thousand gallons. Before installation of the plant, the city was forced to have water shipped in by railroad tank car at a cost of $7.05 a thousand gallons. The city is expected to save more than $400,000 on its water bill in the next ten years through the use of the plant.

A successful sea water conversion plant is now in operation on the Island of Aruba in the West Indies, and is producing fresh water for more than 55,000 people. The OSW says the plant is turning out the water for about $1.75 a thousand gallons.

The cost problem in desalination is linked with basic engineering problems encountered in nearly all of the processes. One of the most critical and the most costly problems is the supplying of a low cost source of energy. A certain amount of thermodynamic energy is released when salt is dissolved in water. To remove the salt from the water, it is necessary that an equivalent amount of energy be expended. Proportionately less energy is required for less salty water such as that found in inland brackish wells and lakes. Scaling and corrosion, always big problems in the handling of salt water, also plague many of the processes, particularly those requiring high temperatures.

The Office of Saline Water hopes to come up with the answers to these and other problems during the operation of the five demonstration plants. The first plant will test a multiple effect distillation process known as the "long tube vertical." The plant will be designed to produce one million gallons of fresh water by an evaporation process at a cost of about ninety-six cents a thousand gallons.

The multiple effect methods carry out the evaporation or distillation through several boiling chambers or "effects" to achieve greater efficiency of heat utilization. Steam from a boiler evaporates part of the sea water in the first "effect" chamber. Then the vapor from the first effect moves to the next effect where it passes on its heat, causing evaporation of brine in the second effect. The process is repeated through several chambers and the greater the number of chambers the greater the economy of the heat utilization.

THE multiple effect method is just one of many processes which are being considered. Here's the way the House Committee on Government Operations described some of the other promising processes in a report issued last fall:

"(1) Vapor compression distillation—Vapor from an evaporator is compressed until it is about 10 degrees F. hotter than when originally formed. Then it is returned to the evaporator where it condenses into water. In so doing, it gives up heat in sufficient amounts to evaporate more water.

"(2) Critical pressure distillation—When water under high pressure (about 3,200 pounds per square inch) is heated to about 700 degrees F. it reaches a so-called critical condition in which it will change from liquid to vapor with very small additional energy and correspondingly small loss in heat transfer. The big drawback in this process is the corrosion caused by the high temperatures.

"(3) Distillation by low temperature flash evaporation—Water under low pressures will boil at correspondingly low temperatures. Thus, if warm salt water is enclosed in a chamber in which the pressure is lowered below the boiling point of the salt water, part of the water will flash to vapor which can then be condensed into pure water.

"(4) Freezing—Sea water freezes at about —6 degrees F. Above that temperature, the frozen water consists of small crystals of pure ice and a brine containing the several dissolved salts. Mechanical separation of the pure ice from the brine can be accomplished by several methods. The principal advantages of this process are that its energy requirements are theoretically much less than in distillation and there is minimum scale and corrosion at frigid temperatures. On the other hand the mechanical problems are greater in moving ice than in handling liquids and vapors.

"(5) Electric membrane (electrodialysis)—When salt is dissolved in water its molecules split into electrically charged negative and positive ions. When electrodes are placed in a solution of sodium chloride, for example, the negative ions (chloride) are attracted toward the positively charged electrode and the positive ions (sodium) are attracted toward the negatively charged elec-

(Continued on page 43)

FROM WASHINGTON

BY
MILTON F. LUNCH,
N.S.P.E.'s Legislative Counsel

TVA: SHADOWS AND FEARS

AFTER two days of vigorous debate the House passed the bill giving the Tennessee Valley Authority permission to issue revenue bonds, 245 to 170. Passage of the controversial measure was in the face of a freely predicted veto by President Eisenhower, although the President himself, as usual, has not stated his intention. A similar bill was passed by the Senate in 1957 and was reported by the House Public Works Committee last year, but it died in the Rules Committee. The debate centered largely around Administration amendments to give the Treasury and the Budget Bureau veto authority over TVA's financing plans, under the proposed authorization for the agency to issue up to $750 million of bonds, to be repaid from power revenues. The Administration's control amendments were defeated in the House, but will undoubtedly be pressed further in the Senate. The House did adopt a restriction on TVA's authority to extend its present service area.

Aside from the direct interest of the engineering profession in one of the best-known engineering projects in the world, and one which attracts visitors from the world over, the profession has a deeper interest in what may be called the "socio-political-economic" question of TVA's relationship to the private practice of engineering. Since the revenue bond bill was first introduced, NSPE has called attention to the language buried in a section on lease-purchase arrangements which would permit TVA to "perform engineering and construction work and other services," in connection with the construction of a generating plant or other facilities in which TVA has any interest whatsoever.

At the most recent hearings before the House Public Works Committee, the Society again urged the deletion of the authority for TVA to provide engineering consulting services outside of its own direct operations. Before the NSPE testimony was presented, however, acting Chairman Clifford Davis of Tennessee interjected: ". . . I would like to say this bill does not interfere with professional engineers. The only provision in this bill dealing with that provides that if TVA is going to lease or purchase a piece of property for their own use they would be authorized to give engineering advice on property they would want to control. I just want to throw that out because I am afraid you are seeing shadows. . . ."

Following the NSPE presentation by Executive Director Paul H. Robbins, the following colloquy took place with Rep. Robert E. Jones, Alabama, one of the most vigorous champions of TVA in the Congress:

> Mr. Robbins: * * * We certainly have no quarrel with the fact that there are very capable engineering services in the employ of TVA. The question we raise is that they are not the only qualified and capable services and there are equally good and very capable services in the consulting field.
>
> Mr. Jones: I do not think there is anything in this bill which would create an assumption on your part or the part of your organization to that effect. I do not think any such meaning can be placed on the contents of this bill. Certainly there is no disparagement of the capabilities of other engineers.
>
> Mr. Robbins: If there is none then why must they extend their authority to this?
>
> Mr. Jones: Because it bears a relationship to the total amount of work being done by the organization. This is a bill for the purpose of obtaining additional generating facilities and providing revenue bonds for the acquisition under lease purchase of other generating facilities. So it would seem to me good management on the part of the TVA to use its engineers at the over-all task of producing new generating facilities.
>
> Mr. Robbins: We would agree if this were the work they were doing and if it were the work of the general operation of TVA, but this language says they can do it for anybody, if there is even the potential that they might, at some future date, tie into the area.
>
> Mr. Jones: The language of the bill would not lead you to believe that TVA is anxious to go out in the field of contracting or engineering would it? I do not see how any interpretation like that could be placed on it. * * *

As the scene of this particular battle shifts to the Senate, it becomes pertinent, in view of the accusation that NSPE's fears are imaginary, to explore the record of TVA's engineering activities outside of its own responsibilities.

● NSPE has in its files, and offered to show to the

House Committee, an engineering design, complete with blueprints, for an electrical system for a privately owned processing plant of a produce company in Alabama, with the notation on the blueprint, "prepared by Electric Dept., Tennessee Valley Authority."

On the basis of this evidence, NSPE asked TVA Chairman Herbert D. Vogel, (an eminent engineer) to indicate TVA's policy and authority in providing engineering service to private persons or firms. General Vogel's reply was, in substance, that TVA furnished a customer service program through the local distribution systems similar to that of private utilities, involving a "small group of TVA employees engaged in rendering assistance . . . in solving problems in such fields as lighting, space heating, wiring, commercial cooking and refrigeration and industrial power applications." For authority he cited Section 10 of the TVA Act which authorizes "studies, experiments, and determinations to promote the wider and better use of electric power . . ."

Rep. Robert E. Jones

Paul H. Robbins

Rep. Clifford Davis

- A consulting engineer in Mississippi was retained by a local architect to perform the electrical engineering design for a local public school building. The day before he was to visit the site the architect called and said the engineer's services would not be needed because TVA was offering the service free. In this case the professional engineer called the matter to the attention of his Congressman and in due course was notified that TVA's defense was that the locally-owned power plant, which would service the school, "uses T.V.A. power, and that the electrical engineers were not paid by the tax payers, but that they were paid by the consumers of T.V.A. power. They insisted further that since a portion of the renovation project had to do with electrical planning these engineers were doing no more than would be done by engineers of private consumers."

Gordon R. Clapp, then chairman of the TVA board of directors, further commented in a letter to Senator Stennis that the engineering work resulted from a school lighting demonstration sponsored by a local Lions Club and TVA's work was at the invitation of the local utility, "which took into account limited funds available to the school board." He added then, what is apparently still the position of TVA, ". . . that it is highly desirable for TVA and the local distributors of TVA power to carry on such activities as this. Incidentally, such services are customarily rendered by utility systems throughout the country." Mr. Clapp added that such services are paid for by the municipal and cooperative distributors of TVA power, hence, "appropriations from the Federal Treasury to TVA are not used for any such work."

- The mayor of Oxford, Mississippi, sent a letter to local electric customers stating that the city had engaged the services of the TVA engineering department "to do something about air conditioning." Customers were urged to act early before the hot weather set in because "the demand for this service may be so great that these engineers may not be able to get around to serve you as soon as you may want them." Plans and specifications for the installation of air conditioning were to be secured by filing an application at the local office. The letter particularly emphasized "that the services of these engineers are available at no cost to you for any engineering needed in connection with electric wiring layouts, electric power, electric heating, electric refrigeration as well as air conditioning. They are qualified registered engineers." (At this point NSPE members may take some consolation in the fact that the engineers were at least registered.)

The examples cited above could apparently be multiplied many times over. The profession then, and particularly consulting engineers, face some difficult questions. Is it true that TVA is doing no more than other power companies in providing free engineering service? If so, is there a difference between the two because one is publicly owned and the other privately owned? Carried to its logical conclusion, the TVA position becomes one of taking over completely all electrical engineering design activities in its service area. It is obvious from the relatively limited evidence at hand that TVA's stand will not be changed short of a Congressional mandate, and here one runs into the political fact of life that the members of Congress from the TVA-area states have seniority, prestige, and great influence. At the same time they are generally conservative in their social and economic outlook and, individually, would be the first to decry Government entry into private business. Whether NSPE is able to eliminate the engineering authorization wording in the revenue bond bill, or not, it is apparent that the more basic and continuing issue is the principle of providing engineering service through private practitioners.

Company Report: Pan Am At Cape Canaveral

Here is an Atlas being pulled into one of its four 10-story gantries at the Cape. Fuel tanks are seen at the bottom of the picture.

At the Air Force Missile Test Center, located at Patrick Air Force Base and Cape Canaveral, Florida, all phases of engineering are daily taking on newer and wider aspects. Engineers and technicians make up a large percentage of the 18,000 employees at the base, Cape, and on the missile-tracking down range islands and ocean vessels.

A great many of these ubiquitous engineers and technicians work for Pan American's Guided Missiles Range Division (GMRD), the only non-flying Pan Am division. Pan American is under contract to the U.S. Air Force for running the Atlantic Missile Range, and has prime responsibility for the management, operation and maintenance of the 6,300 mile missile test range stretching from Cape Canaveral to Ascension Island and beyond in the South Atlantic.

Pan Am's engineering responsibilities are many and multifarious. The company must provide all types of support for every missile firing or test. The job actually begins long before the missile ever arrives at Canaveral; it begins when the missile is born on the drawing boards.

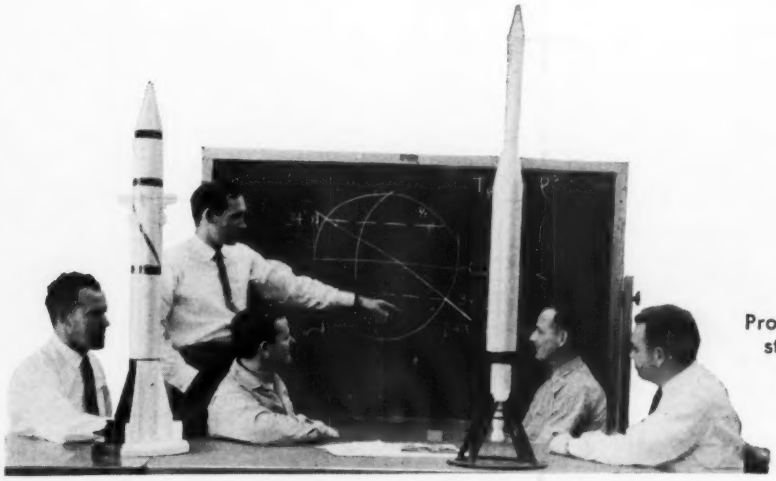
At the huge $7 million Technical Laboratory on the base, a group of twenty-three engineers man the Program Management section. They are the project planners; their work encompasses all phases of missile activities at the center.

When a particular company is awarded a missile contract (Convair for Atlas, Martin for Titan, Lockheed for Polaris, etc.) the test program will probably be conducted at Cape Canaveral (unless it is a small, short-range missile). All intermediate range and intercontinental missiles are tested at the Cape.

When the program is assigned to the Missile Test Center, the Air Force lists possible program requirements in an outline guidance manual. This allows Program Management's engineers to begin preliminary plans, and, in some instances, to make budget estimates.

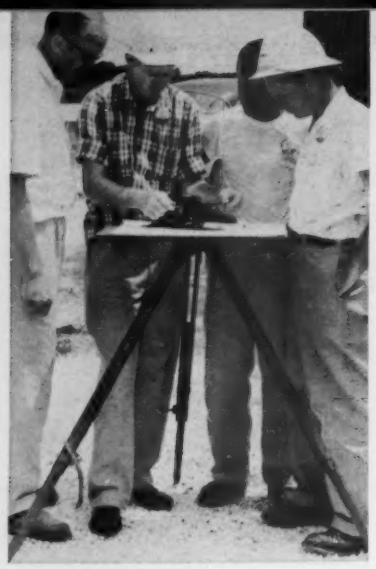
The awarded contractor representative arrives soon after this and presents, at a verbal meeting, what requirements his particular missile will need. Later, he submits an official program requirement document, and from this Program Management develops support plans covering logistics, supply, instrumentation, data reduction, pad services; everything the incoming contractor will need. Manpower and equipment needs are also mapped out.

Later, as his missile becomes



Program management boss Russ Barnes, standing, goes over coming support requirements with members of his department. In foreground, l.-r., are models of the Jupiter and Vanguard satellite-sending vehicles.

—Photos by Don E. Boyd



Geodetic engineers conduct surveys at the Cape in direct support of missile launches. They must check out the angle and azimuth the flight will take.

ready for testing, the contractor submits operational requirements. These state specifically all requirements needed in direct support of each missile shoot. These operational requirements change constantly even after the program is under way. Increased efforts for perfection naturally cause changing support needs.

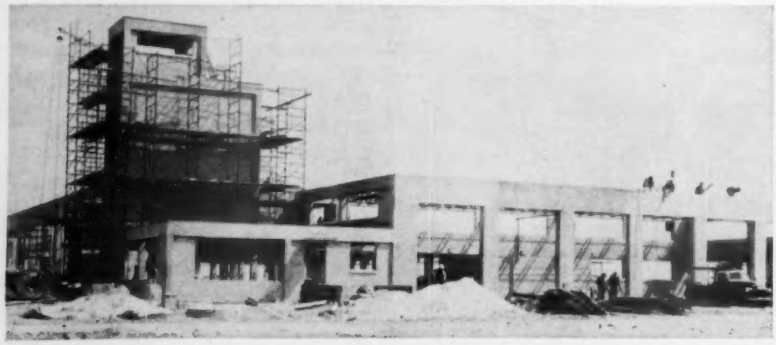
To adequately fulfill this line of support, Program Management has divided its engineers into four separate units. Six engineers work with the Air Force Ballistic Missile Division (AFBMD); the bulwark of the Free World's defense arsenal which includes the Titan, Atlas, Thor, and the forthcoming Minuteman.

A dozen additional engineers work with the Army, Navy, and the Air Force special missile groups. The Army cluster of missiles includes the Redstone, the tactical Jupiter and Jupiter "C," the Juno space-probe rocket, and the soon-to-arrive Pershing. The Navy's program includes the Vanguard and the Polaris, while the Snark, Bomarc and Matador compose the Air Force's array of special missiles. Coordination is also maintained with the National Aeronautics and Space Agency (NASA) on such space-probe vehicles as the Vanguard, Juno, and Thor-Able.

WHEN the missile contractor's requirements extend further, calling for professional planning and engineering services for the facilities development, and operation and maintenance engineering, a request is submitted to Facilities Engineering's department, which has over sixty professional graduate engineers.

Although Facilities Engineering neither designs nor builds the actual complexes, they are responsible for planning, sitting, programming and developing design criteria (planning reports) for support facilities at Cape Canaveral. These engineers have successfully completed such work for the Atlas, Thor, Jupiter, Vanguard, Titan, and Polaris programs.

Concurrent with these assignments are the equally difficult and complex demands for the preparation and maintenance of master plans, and the planning and programming of instrumentation and support facilities to permit the accomplishment of accelerated test programs.



Construction of facilities at the Cape, and on the down range islands, is planned by Pan Am's Facilities Engineering Department.

These included advance radar and tracking facilities, facilities for liquid and solid fuels (including such exotic fuels as unsymmetrical dimethyl hydrozine), and major utilities expansion.

Facilities Engineering has gained wide experience in the evaluation of missile test requirements relating to facilities. Their knowledge and versatility in any architect-engineer service desired in the missile testing field allows them to work efficiently and economically.

Immensity of a project—from start to finish—is exemplified in the cost breakdown of the $42.5 million Atlas program at Canaveral. (The 98-ton Atlas is our only near-operational super Intercontinental Ballistic Missile at the present time.) Program expenses were as follows:

- —Four missile launch facilities (pads) —$18 million.
- —Three missile assembly buildings—$6 million.
- —Two guidance and control facilities—$6 million.
- —Four telemetry (tracking) facilities—$6 million.
- —A coolant water deluge pumping facility (which can pour 30,000 gallons per minute on the pad for cooling purposes during a blastoff) —$750,000.

The following four items were originally included in the Atlas budget, but are now being used for other long-range missile programs too.

- —A liquid oxygen (fuel) manufacturing plant—$2,750,000.
- —Impact predictor facilities—$500,000.
- —AZUZA (tracking) facilities—$1,250,000.
- —Missile impact location (MIL's) facilities—$300,000.

The Atlas is the largest single program at the Missile Test Center. Other project costs fall in line behind it like this: Titan ($22,400,000); Vanguard ($14,815,000); Polaris ($11,205,000), and Thor ($10,400,000).

Operational engineering services are performed at Patrick AFB for Cape Canaveral, Port Canaveral, eleven down range island bases and seventeen coastal satellite stations. Facilities Engineering services in-

clude architect-engineering, consulting and operational engineering services. During the past two years, these services have represented a total gross value of approximately $25 million.

In the field of missile range support, planning services have been provided as follows:

—Utilities expansion (power and water) —$8,100,000.

—Instrumentation (tracking) facilities on the Florida mainland—$7,525,000.

Charles L. Ellis, Pan American's Division technical manager.

—Instrumentation (tracking) facilities on the down range chain of island bases—$4,525,000.

—Support facilities on the Florida mainland—$5,500,000.

—Support facilities on the down range islands—$21,400,000.

Totaled, all these range support facilities represent an outlay of $47 million.

To adequately meet these awesome requirements, Facilities Engineering is particularly careful in its selection of qualified personnel. The department is staffed with sufficient registered professional engineers to insure quality of work. Engineer applicants are obtained by recruiting and are selected on their recognized capabilities.

FACILITIES Engineering's requirements include an intimate knowledge of the procedures of military construction agencies; the Corps of Engineers and the Bureau of Yards and Docks. All of their work is performed in accordance with military construction standards.

This capability, combined with their experience in the missile testing field, have qualified them as specialists and their services are requested, on a consultant basis, by many missile agencies interested in the Caribbean, Central and South American areas.

Another reason for requests for their services results from their work in developing the down range string of missile-tracking island bases; from Grand Bahama Island off the Florida coast, to Ascension, 5,000 miles down in the South Atlantic Ocean.

Facilities Engineering undertook reconnaissance of virgin areas often mapping areas accurately for the first time, made site selections, prepared planning reports and designs, and assisted in the construction of these bases. The Air Force subsequently inspected and accepted each base's missile support and tracking facilities as operational.

The department is divided into two main sections: Facilities Planning and Plant Engineering. Master Planning and Programming are under Facilities Planning. Photogrammetric capability, making contour maps from aerial photographs, is done by Master Planning.

Eight sections are grouped under Plant Engineering. They are: Production Controls, Expediting and Monitoring, Mechanical Engineering (air conditioning), Mechanical Engineering (general), Civil Engineering, Electrical Engineering, Fuels and Propellants, and Survey.

In a typical situation, the missile contractor presents its project to the Planning section. Planning selects a site for the project, undertakes initial planning, formulates feasibility studies and develops master plans.

The project is then handed to the Programming section, where budget estimates are considered, basic layouts are promulgated, planning reports are prepared and design evaluations are accomplished.

The Survey section conducts topographic and geodetic surveys in support of many projects. Surveyors also work through every test called for by each project. They line up the flight and angle the missile will take, prior to each firing.

The engineering sections (civil-architectural-structural-mechanical-electrical) make up specifications, designs, schedules, estimates and materials lists. From here, the drafting rooms prepare construction drawings, and keep all engineering plans and specifications, reports, records and files.

All Pan American engineering work isn't done in the missile's planning or construction stages however. Much of it is in direct support of static tests and actual launches.

Missile countdown lists contain thousands of items to be checked, each with its individual importance. From this master list, four operations engineers "weed out" all duties Pan Am is to perform during the test, and combine these into a separate list. This is then sent to all PAA support and service groups concerned.

These lists are also dispatched to the down range bases and to missile-tracking ocean range vessels via teletype. They tell when and where each section is to come in on the countdown to perform its support duties, be it fueling, security, safety or tracking of the missile's flight.

EQUALLY vital to the success of missile tests are the twenty-eight engineers and junior engineers in the Pad Engineering section at Cape Canaveral. Their main job is to keep launching pads in operational readiness.

A chief engineer is assigned by this section to each of the eighteen pads currently in use at the Cape. This engineer must completely familiarize himself with his individual pad area, and be able to meet all conditions and problems that may arise. A mechanical engineer

Electrical engineers, also under facilities—plant engineering section, check over equipment at their technical laboratory headquarters.

is also assigned to each pad, and an electrical engineer to every other pad. Specific programs are assigned a complement of pad engineers who work around the clock during tests.

This section is divided into test and pad engineering. Test engineering work includes sampling fuels and oxidizers in use at the Cape to make sure the quality meets the missile contractor's needs. This calls for a chemical engineer and his assistants.

To insure that pad facilities are kept operational, field engineers hold checkouts with pad services personnel. Industrial engineers keep a stockpile of spare parts for the pad in case of any last minute emergency. Mechanical and electrical engineers stand by on every test, working right along with the contractor engineers.

Once, a missile blew up on a pad causing $60,000 worth of damage, badly searing the area. Pad Engineering immediately took over and reconstructed the pad. Another time, a bad fire on a pad did extensive damage, but Pad Engineering had the facilities rebuilt and operational within five days.

To cope with such occasional mishaps, safety engineers must come up with solutions to problems quite unique in ordinary industrial areas. Dangers of missile fuelings, toxic gases, blowups and fires must be considered in addition to normal hazards. To enforce safe practices at the Cape, a qualified staff of pad safety supervisors take charge of the launching areas—safety wise—during all tests.

Sanitary and industrial hygiene engineers at the Cape also have duties with growing importance. The sanitary engineer acts as a consultant for chemical and biological labs for analysis of boiler water, air conditioning cooling water, and for other industrial uses to maintain health standards.

He also conducts tests on the quality and quantity of demineralized water. This water is then used by the contractor to wash down the missile prior to firing time, to get all foreign materials off of it. When fuel is spilled on the missile, it could ignite and explode when fired—if it was not washed off in advance.

Sanitary and industrial hygiene engineers at Cape Canaveral analyze boiler water, air conditioning cooling water and demineralized water to maintain health, and safety standards.

The industrial hygiene engineer handles health hazards pertinent to toxic fuels, various solvents, severe noise, and improper lighting. He does research for the pad safety men who put his theories into practice on the complexes.

Also at the Cape, a chemical engineer is in charge of missile propellents. All missile fuels are stored, transported and used under his direction.

Some four thousand miles to the southeast of Cape Canaveral, a string of missile-tracking ocean range vessels patrol the waters between Fernando de Noronha (just off the Brazilian coast) and distant Ascension (midway between Africa and South America). These ships are used to acquire flight data from intercontinental ballistic missiles, and to recover missile nose cones which plummet into the South Atlantic waters.

To keep these ships operational, Pan American maintains a staff of five marine engineers who make estimates, plans and specifications for ship repairs and remodeling.

UNDER Technical Operations, another staff of five engineers plan marine operations to recover the missile nose cones after they have reentered the atmosphere and have landed in their pre-determined impact area. Tech Operations also employs three electronics engineers who plan and program the installation of electronic equipment on board recovery and sub-cable vessels. A staff of technicians install and maintain this special equipment.

Working closely with marine operations, a contract liaison engineer monitors technical aspects of subcontracts awarded by Pan Am. One of his duties was checking out the installation of instrumentation equipment on tracking vessels as they were being readied for service. Most of his work is connected with communications, timing and telemetry.

There is also a planning engineer, responsible for continuous-wave tracking, data reduction equipment and shipboard instrumentation systems.

In the Range Control section, an engineer acts as instructor for a streamlined operations training course. Young engineering prospects are given this course and sent down range as operations assistants to work up to positions as base managers, or to technical positions at Patrick AFB.

In addition to the string of Air Force down range island bases, Pan Am maintains seventeen satellite sites along the Florida coast. These sites house tracking instrumentation equipment, and high-powered cameras and telescopes which gather data on each missile flight. A maintenance engineer is on duty at the base to meet any problems that may arise in the operational upkeep of these sites.

And, to better coordinate departments within the company, a staff of seven industrial engineers work as systems analysts. They study methods and procedures of different key sections like supply, accounting, and administration, and write up ways to improve work and production.

In all, Pan American's Guided Missiles Range Division has over 150 professional graduate engineers, and countless more engineering technicians working in the missile preparation and support field. These are dedicated and proud men, working in all lines of engineering for a common purpose: to assure our national defense and scientific research in space—through the advancement of our missile and rocket programs.—**End.**

New Literature

PIPE COILS—"Price Data Bulletin No. 259" is the name of a bulletin published by the Dean Thermo-Panel Coil Division of Dean Products, Inc. The bulletin relates entirely to the Dean Thermo-Panel Coil which takes the place of pipe coils. Old-fashioned pipe coils, according to this manufacturer, are now obsolete. The Dean Thermo-Panel Coil is made of a wide variety of metals. Thus if you should want to heat a given liquid that dissolves iron, copper, or brass, but does not affect Carpenter 20, the thing to do is to specify Carpenter 20. Costs, in most instances, can be estimated by the reader himself by reading page 3. The 4-color bulletin contains valuable tables which show the claimed advantages of this Dean product over pipe coils and tubing.

(Circle 15 in Readers' Service Dept.)

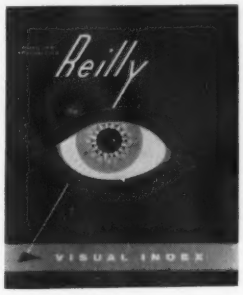
INDUSTRIAL TRUCKS — Material handling engineers will be interested in a technical brochure "Walkie or Rider Trucks," published by the Automatic Transportation Company. This brochure gives the pros and cons for both the walkie and rider-type industrial trucks and how they are used in industry. Advantages and applications for both types of trucks are outlined, along with a convenient check list giving facts to consider when analyzing truck requirements. Illustrations show how both the walkie and rider-type trucks fit into a wide variety of material handling programs. This 8-page, two-color brochure contains useful information which will assist the material handling engineer in selecting the correct industrial truck to fit his individual job applications.

(Circle 16 in Readers' Service Dept.)

EQUIPMENT—Plan Hold Corporation, manufacturer of vertical and roll filing systems, has just issued its new catalog for 1959. Items included are of special interest to engineers, designers, and architects. The 2-color catalog has large illustrations of all products.

(Circle 17 in Readers' Service Dept.)

VISUAL INDEX—A visual index that simplifies the selection of coal tar protective coatings for the heavy construction industry is now available from Reilly Tar and Chemical Corporation. The brochure features a large panoramic industrial scene that is color coded to show at a glance which applications each of the many Reilly coal tar protective coatings is best suited for. The brochure gives a quick reference description of each product in non-technical terms, stressing the application rather than the chemical contents.



(Circle 18 in Readers' Service Dept.)

BATTERY CHARGERS — Compact, vertically-mounted motor-generator battery chargers which save up to two-thirds on floor space are described in a bulletin offered by Exide Industrial Division of The Electric Storage Battery Company. By mounting the simplified-design, lightweight chargers overhead on pillars or walls, the bulletin notes, floor space requirements can even be eliminated altogether. The 4-page, illustrated bulletin points up major design features, with photos and line drawings supplementing text. Simple, one-two-three procedure for operating the charger is described and illustrated. Dimensions, ratings of the various models, size and other specification information is included in chart form.

(Circle 19 in Readers' Service Dept.)

INDUSTRIAL GASES—A revised 24-page catalog describing the complete line of Airco manifolds for industrial gases is now available from Air Reduction Sales Company. This catalog contains specific information—with illustrations—on capacities, dimensions and arrangement, along with general background material on the advantages of manifolding. The revised edition includes information on recently developed manifolds for carbon dioxide (CO_2), and liquid oxygen, argon and nitrogen, as well as current data on the standard manifolds for gaseous oxygen, argon, nitrogen, helium, acetylene, hydrogen, and propane.

(Circle 20 in Readers' Service Dept.)

BUILDING PRODUCTS—A brochure file on Reynolds "Lifetime" aluminum commercial building products has been published as a service to engineers, architects and contractors by Reynolds Metals Company. The file folder contains separate brochures on Reynolds commercial acoustical systems, corrugated roofing and siding, field-assembled insulated wall system, roof deck, ribbed embossed siding and V-beam roofing and siding. The six building products are designed for commercial, industrial, and institutional buildings. Information given in the brochures include uses, advantages, erection methods, specifications, and accessories.

(Circle 21 in Readers' Service Dept.)

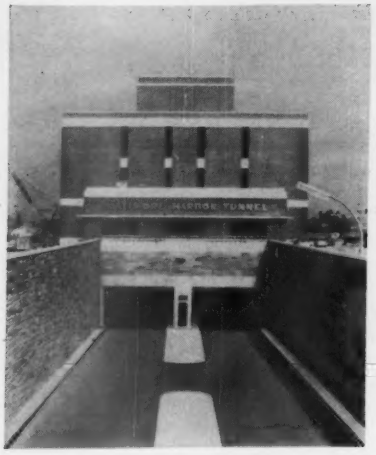
TRACTOR SHOVEL—A specification bulletin explaining the features of the new Model 304 Trojan tractor shovel has been released by the Trojan Division of The Yale & Towne Manufacturing Company. Of interest to contractors is the fact that the new Trojan 304 has three interchangeable buckets, which give the machine a carrying capacity of from two to four yards. The 2-page color bulletin lists the standard and optional equipment for this newest Trojan tractor shovel.

(Circle 22 in Readers' Service Dept.)

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims. To receive any of the new literature described in this column, merely circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

How to Solve a Traffic Headache:

Baltimore's Answer—Bury It!



Here's the south entrance of the Baltimore Harbor Tunnel. In the background is one of the project's two ventilation buildings where exhaust fans draw out fumes from the tunnel's interior. The tunnel—7,650 feet—is the longest trench type tunnel in the world.

TRAFFIC CONGESTION, a by-product of America's mass transportation age, plagues virtually every metropolitan area in the U. S. today.

And in many places the problem isn't getting any better. The motoring population is increasing steadily and now many new super highways, like the Federal interstate program, are funneling more and more traffic on to overcrowded city streets.

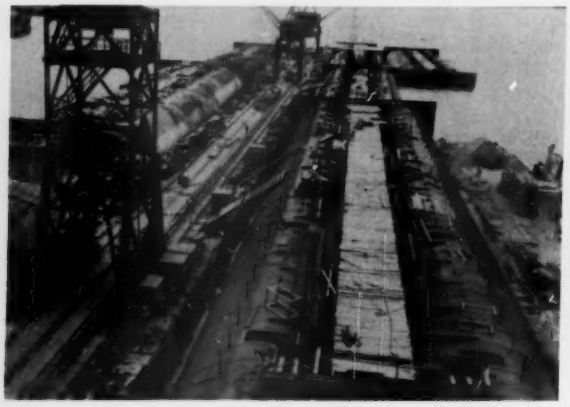
Despite the complexity of the problem, cities do on occasion come up with solutions. One of those that did is Baltimore on the Atlantic Seaboard.

Baltimore, the nation's sixth largest city, had one of the classic examples of a metropolitan traffic jam. For years the city had been the bottleneck for the mass of automobile and truck traffic which moved between Washington and New York City. It usually took well over an hour for the average motorist to creep through fifty-one traffic lights, narrow streets and dozens of confusing turns in downtown Baltimore. The result was a traffic nightmare that was fast becoming impossible.

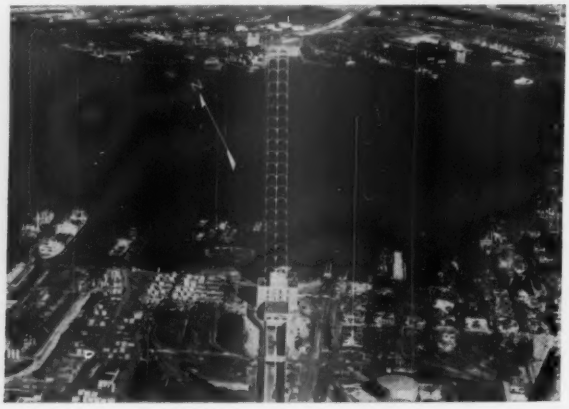
Baltimore, or to be more exact, the State of Maryland, went underground to solve the traffic dilemma. And now motorists speed through the city with ease by means of a 1.7 mile long tunnel buried 100 feet below Baltimore's harbor.

The tunnel was an expensive answer to the problem—$130,000,000. But, indications are that the project was worth every cent. Nearly a million vehicles a month are taken off the narrow downtown streets, thanks to the underground structure. Now the average vehicle is able to get through the city in about fifteen minutes compared to a minimum of an hour required to negotiate the old route in downtown Baltimore.

The tunnel apparently has done all right financially during the first eighteen months of its operations. So well, in fact, that the revenue bonds which financed the project may be paid off within eighteen to twenty years. The bonds originally were not scheduled to be paid in full until 1994. Revenues from the tunnel plus the tolls from Chesapeake Bay, Potomac, and Susquehanna River bridges are pledged to the bond issue. The tunnel alone



Tunnel tubes undergoing final work before they were lowered into trenches on the harbor bottom. Each section was lined with an inner ring of concrete and fitted with a 22-foot roadway slab before it was placed into position.

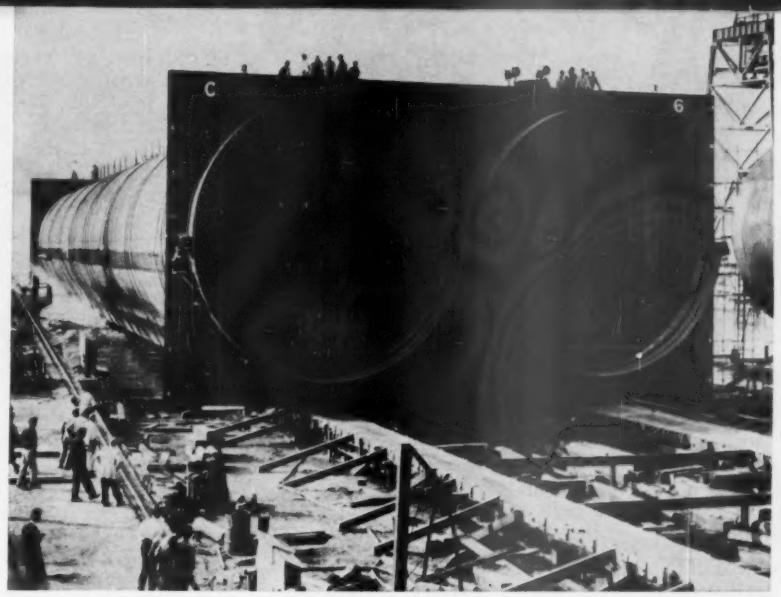


This is where the tunnel crossed the Baltimore Harbor. The 1.7 mile tunnel now allows traffic to by-pass downtown Baltimore, cutting travel time in nearly a fourth.

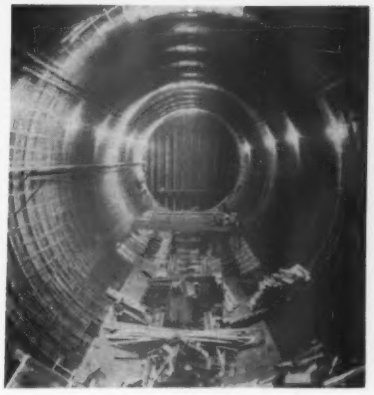
has taken in $5,587,000 through March 31 of this year. Tolls range from forty cents for passenger cars up to eighty-five cents for the largest trucks.

The tunnel's financial success is determined, of course, by the traffic volume. And present trends indicate a continued rise in traffic. In March of this year, 951,981 vehicles sped through the tunnel, a thirty-seven per cent increase over the previous year. This summer, tunnel officials expect to handle as many as 1.5 million vehicles a month.

L. J. O'Donnell, director of the Toll Facilities Division of the Maryland Road Commission, tabs the structure as the "fastest and safest" of its kind. There has been only one fatality in the first eighteen months and that was on one of the approach routes. Speed limits in the tubes are pegged at forty-five miles an hour, ten miles an hour faster than most tunnels. The Baltimore tunnel used the conventional 35-mile an hour limit when it first opened, but soon found that it was too slow for the volume of traffic. Using the 45-mile an hour speed it is possible to push between 3,600 and 4,000 vehicles through in an hour, compared to 2,500 with the slower speed. Surprisingly enough, the accident rates have gone down as the speed has gone up. O'Donnell says motorists apparently pay just a little more attention to their driving when they are moving at the faster speed.



One of the prefabricated tunnel sections slides down the shipway at Camden, N. J. The section, along with twenty others, was floated to Baltimore and lowered into a trench dredged on the harbor bottom.



Here's the way the tubes looked as workmen laid the roadway. After this work was completed the tubes were lowered and joined together under water. Each section weighed about 20,000 tons, 1500 tons of steel, and 18,500 tons of concrete.

THE project is known as the Baltimore Harbor Tunnel, but it includes a great deal more than the tunnel. There are seventeen miles of limited access approach expressways which were included in the $130,000,000 construction figure. The expressways required five stream crossings, thirty-five highway grade separation structures, four railroad grade separation structures, four viaducts and sixteen culverts.

But the tunnel is easily the most spectacular feature of the whole project. It is unique in a number of ways. For one thing, it is the longest twin-tube tunnel—7,650 feet—built by the trench method. And its construction was an engineering marvel. The twin tubes were prefabricated in twenty-one sections at three different shipyards. Twenty-one sections, each 300 feet long, were joined together underwater, to form the tubes. Each of the sections was prefabricated in shipyards, launched like ships and then floated to the tunnel site. There an exterior protective pneumatic mortar was placed on the steel shells. At the same time interior concrete was poured as a lining and the rough base of the roadway was laid. When the sections reached the point of negative buoyancy they were lowered by power winches into previously dredged trenches on the harbor bottom.

The sections were aligned by use of temporary masts which projected above the surface of the water. After the sections were securely in the trenches, divers, operating entirely by sense of feel, joined the sections together. Each section was opened by first sealing the joints with underwater concrete, then knocking out the bulkhead nearest the land side—beginning with the dry or land section on each side of the harbor. The interior work, including installation of the tiling, lighting, and the roadbed, was then completed.

Taking advantage of lessons learned on similar projects, engineers incorporated safety with a capital "S" into every phase of the tunnel design.

One of the most important features of any tunnel is its ventilation system and the Baltimore designers didn't stint on this phase of the work. The system, which accounted for about $4 million of the tunnel's cost, changes the air in the tubes thirty-eight times an hour, leaving the air in the tunnel fresher than that found in many office buildings.

The ventilating system was designed by Ole Singstad, one of the country's leading tunnel engineers. Singstad first gained prominence in the early 1920's when he adapted a new ventilating system for New York's Holland Tunnel.

Singstad's system calls for separate pipes and ducts within the tunnel tubes which supply fresh air at frequent points without high air currents in the roadway area. His method removes exhaust gases quickly and is controllable at any one point so as to prevent spread of any fire which might break out in the tunnel.

The Baltimore tunnel has a ventilation shaft and building at each end of the tunnel. Fresh air is pumped through a duct under the roadway and distributed through air flues at close intervals along the tunnel on each side just above the roadway. Foul air is drawn off into ducts above the tunnel ceiling. There are thirty-two that supply the fresh air and draw off exhaust air, located in the two terminal ventilation buildings. Twenty-four are in service at all times, twelve on each side of the harbor. The other eight are operating spares. The design standards require that the carbon monoxide content of the air shall not exceed 2.5 parts in 10,000 parts of air. That's quite a ventilating job when it is considered that nearly 30,000 vehicles, each giving off noxious exhaust fumes, pass through the tubes each hour.

The tunnel's elaborate system of fluorescent lighting is also keyed to maximum safety. Each tube is illuminated by two continuous rows of fluorescent lamps, one on each side of the roadway just below the ceiling. The lighting is graduated, being the brightest at the portals and being gradually reduced in intensity towards the center. This offsets the initial change from bright daylight to the lighted interior. The intensive lighting zone extends about 1,500 feet into each tube from the entrance portals with normal lighting zones extending through the remainder of the tubes.

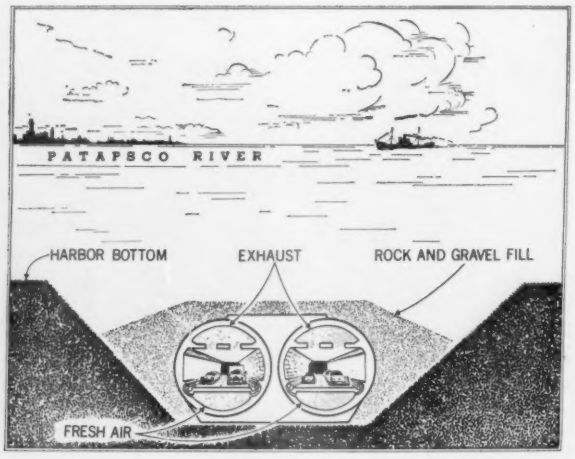
Ole Singstad

The intensity of each zone is controlled by saturable reactors connected in each phase of each lighting circuit. During daylight hours, maximum current is maintained over 750 feet in from the entrance portal to afford the eye sufficient time for satisfactory adaption from high daylight level outside to lower levels inside. During night hours, the direct current to the reactors is disconnected automatically by an astronomical time-clock.

All this concern with safety has apparently paid off. To date, there have been few really serious mishaps despite the heavy volume of traffic. An 111 man police force patrols the entire length of the project, prepared for any eventuality. Their primary job is to keep traffic moving. Most stoppages in the tunnel are from minor causes —motor trouble, running out of gas. The average stoppage is cleared in less than four minutes.

If the tunnel is a monument to traffic safety, there are plenty of good reasons why. Some of the country's leading engineers were called in to provide the know-how. J. E. Greiner Co., of Baltimore was the over-all consulting firm for the project. The contracting engineers included Singstad and Baillie, New York, N. Y.; Green Associates, Inc., Baltimore; Louis Berger and Associates, Orange, N. J.; Clarkeson Engineering Co., Inc., Boston, Mass.; Joseph K. Knoerle and Associates, Inc., Baltimore; William H. McFarland, Binghampton, N. Y.; Rummel, Klepper and Kahl, Baltimore, and Coverdale and Colpitts, New York, N. Y.—**End.**

The tunnel project included seventeen miles of approach highways. Shown here is the Pulaski Highway overpass on the tunnel's north approach. Nearly a million vehicles a month use the tunnel and its approach routes.



Underwater view of tunnel tubes. The twin tubes rest on the harbor floor about 100 feet below the surface of the water. The tubes were laid in trenches and then covered with a rock and gravel fill.

Professional Employees and the Wage-Hour Act

THE recent Supreme Court decision in the *Lublin, McGaughy* case (AMERICAN ENGINEER, Feb. 1959) held that draftsmen, fieldmen, clerks and stenographers employed by engineering consultants and working on plans and specifications for the repair and construction of air bases, roads, highways, terminals, and radio-TV installations were engaged in interstate commerce, and thus covered by the Wage-Hour Act. This decision resolved conflicting opinions on this point between the 4th and 8th Circuit Courts of Appeal, a situation which prompted the Supreme Court to agree to review the *Lublin, McGaughy* case.

While the Supreme Court decision is, legally speaking, applicable only to the one firm involved, it has been generally accepted by consulting engineers as decisive of the basic issue. Consulting engineers may exercise their right to further litigate the issue of coverage, or any aspect of it, but reaction to date indicates that additional litigation is not likely.

Inasmuch as many consulting engineers have not operated heretofore under the Wage-Hour Law in terms of technical compliance, even though many had, in fact, paid more than the minimum requirements as a practical matter, it becomes pertinent to review the basic provisions of the law and some of the various requirements under it. Also, of special importance to consulting engineers is an understanding of the exempt employees, particularly professional employees.

The Fair Labor Standards, or Wage-Hour Act as it is usually called, provides for a minimum wage of $1.00 per hour, plus time and one-half for all hours worked in excess of forty in any one week, for employees who are either engaged in the production of goods for commerce, or in interstate commerce itself. The minimum wage and overtime pay provisions do not apply, however, to "any employee employed in a bona fide executive, administrative, or professional capacity * * * (as such terms are defined and delimited by regulations of the Administrator)." Because of space limitations, only the exemption for *professional* employees will be discussed here so that consultants will be in a better position to differentiate between professional and nonprofessional employees, and thus determine who must be paid according to the Wage-Hour Law's terms. However, additional information on the other exempt categories can be secured from the local Wage-Hour office or from NSPE.

It can be seen that the statute merely declares that "professional" employees are exempt, and delegates to the Administrator the task of defining the precise limits of the exemption. Consequently, the Administrator has promulgated regulations defining "professional" employee, and in addition, has issued bulletins explaining and illustrating the terms used in the regulations. The courts have sustained both the delegation and the definitions issued thereunder, with the result that the Administrator's regulations have the force and effect of law as much as though they were written into the Act.

"Professional" employees have been defined by the Administrator as follows:

Section 541.3—Professional

The term "employee employed in a bona fide * * * professional * * *, capacity" in section 13 (a) (1) of the act shall mean any employee:

(a) Whose primary duty consists of the performance of work:

(1) Requiring knowledge of an advanced type in a field of science or learning customarily acquired by a prolonged course of specialized intellectual instruction and study, as distinguished from a general academic education and from an apprenticeship, and from training in the performance of routine mental, manual, or physical processes, or

(2) Original and creative in character in a recognized field of artistic endeavor (as opposed to work which can be produced by a person endowed with general manual or intellectual ability and training), and the result of which depends primarily on the invention, imagination, or talent of the employee; and

(b) Whose work requires the consistent exercise of discretion and judgment in its performance; and

(c) Whose work is predominantly intellectual and varied in character (as opposed to routine mental, manual, mechanical, or physical work) and is of such a character that the output produced or the result accomplished cannot be standardized in relation to a given period of time; and

(d) Who does not devote more than twenty percent of his hours worked in the workweek to activities which are not an essential part of and necessarily incident to the work described in paragraphs (a) through (c) of this section; and

(e) Who is compensated for his services on a salary or fee basis at a rate of not less than $95 per week (or $70 per week if employed in Puerto Rico or the Virgin Islands) exclusive of board, lodging, or other facilities: *Provided,* That this paragraph shall not apply in the case of an employee who is the holder of a valid license or certificate permitting the practice of law or medicine or any of their branches and who is actually engaged in the practice thereof:

Provided, That an employee who is compensated on a salary or fee basis at a rate of not less than $125 per week

This analysis and comment *by Stanley H. Stearman, Assistant Legislative Counsel, NSPE, and Member, District of Columbia Bar.*

(exclusive of board, lodging, or other facilities), and whose primary duty consists of the performance of work *either* requiring knowledge of an advanced type in a field of science or learning, which includes work requiring the consistent exercise of discretion and judgment, or requiring invention, imagination, or talent in a recognized field of artistic endeavor, shall be deemed to meet all of the requirements of this section.

As further explained by the Administrator, the term "professional" includes those professions which have a recognized status and which are based on the acquirement of professional knowledge through prolonged study. As described in section (a)(1) of the definition, the first element in the requirement is that the knowledge be of an advanced type, that is, knowledge which cannot be attained at the high school level. In addition, it must be knowledge in a field of science or learning, as distinguished from the mechanical arts where, in some instances, the knowledge is of a fairly advanced type. Thirdly, the requisite knowledge must be customarily acquired by a prolonged course of specialized intellectual instruction and study. The word "customarily" only implies that in the vast majority of cases specific academic training is a prerequisite for entrance into the profession. The exemption would not be lost for the engineer who is not the possessor of a bachelor's degree, provided he meets the definition in all other respects.

According to section (b) of the definition, a professional employee must perform work which requires the consistent exercise of discretion and judgment in its performance. A prime characteristic of professional work is the fact that the employee does apply his special knowledge or talents with discretion and judgment. Purely mechanical or routine work is not professional.

Section (c) requires that the employee be engaged in work predominantly intellectual and varied in character as opposed to routine mental, manual, mechanical or physical work. This test applies to the type of thinking which must be performed by the employee in question. For example, although a professional engineer may make a series of similar tests, the problems presented will vary as will the deductions to be made therefrom. The work of the true professional is inherently varied even though similar outward actions may be performed, the Administrator has explained.

It can be seen from section (d) that for an employee to be considered "professional," he must not devote more than twenty per cent of his hours in the workweek to activities which are not an essential part of and necessarily incident to the professional type of work described in sections (a) through (c). This section has the effect of including within "exempt" work those activities which are an essential part of and necessarily incidental to his professional work, even though such activities might not be "professional" in and of themselves. This provision recognizes the fact that there are professional employees whose work necessarily involves some of the actual routine physical tasks also performed by obviously nonprofessional, nonexempt employees. The Administrator has illustrated this point by referring to a chemist who, in performing important and original experiments, frequently finds it necessary to perform himself some of the most menial tasks in connection with the operation of his experiments, even though at times these menial tasks can be conveniently or properly assigned to laboratory assistants. Thus, time spent in nonexempt work, that is, work which is *not* an essential part of and necessarily incidental to the exempt work, is limited by the definition to twenty per cent of the time worked by the employee in the workweek.

In addition to the tests discussed, there is an additional requirement that must be met for "professional" status. This is the famous salary test which was recently amended and requires that an employee who otherwise meets the definition of "professional" according to sections (a) through (d) of the definition, must *in addition* be compensated on a salary or fee basis at a rate of not less than $95 per week (formerly $75 per week). An employee will meet this requirement if he is paid a biweekly salary of $190, a semi-monthly salary of $205.83, or a monthly salary of $411.67.

The salary test is not required for "professional" status for employees who are the holders of a valid license or certificate permitting the practice of law or medicine. When amendments to the salary test were recently being considered by the Administrator, NSPE vigorously sought to have this language changed to also exempt registered professional engineers from the salary test.

The term "salary" is intended to mean exactly what it says; hourly paid employees will not satisfy the exemption. The Ninth Circuit Court of Appeals recently ruled that draftsmen and designers employed by an engineering firm were not exempt from the Act's requirements as white collar (executive, administrative or professional) workers as they were paid on an hourly basis. They were disqualified solely because of the hourly nature of their compensation.

The definition of "professional" contains a special proviso, or short test, for employees who are compensated on a salary or fee basis at a rate of at least $125 per week. If an employee receives at least $125 per week, it is not necessary to test his qualifications in detail under sections (a) through (e) of the definition so long as his primary duty actually consists of the performance of work requiring knowledge of an advanced type in a field of science or learning, which includes work requiring the consistent exercise of discretion and judgment.

The definition of "professional employee" as contained in Section 2(12) of the Taft-Hartley Act includes any employee who has completed the courses of specialized intellectual instruction and study and is performing related work under the supervision of a professional person to qualify himself to become a professional employee. In other words, engineers-in-training are considered "professional" under the Taft-Hartley Act. Such is not the case, however, under the Wage-Hour Law, for the Administrator has ruled that the "profes-

(Continued on page 44)

Highway Safety Report Cites Need for Better Engineering

How can we reduce the appalling toll of deaths and serious injuries on America's highways?

For years that's been a favorite question of safety panels, conferences, institutes, studies, and speeches across the country. The statements and recommendations have been many; the results not so convincing.

Today, experts are putting a little less emphasis on the broad educational approach and are seeking more concrete and direct methods of achieving highway safety. As a result, the professional engineer is being called upon more and more frequently to put his talents to work in finding ways of saving motorists' lives.

At the request of Congress, the Bureau of Public Roads recently delved into every facet of the safety problem. Its report "The Federal Role in Highway Safety" gave new recognition to the engineers' part in the over-all safety program.

Reviewing the various contributions to highway safety, the report said "safety has come prominently to the fore in highway and traffic engineering and is inseparably linked to considerations of planning, highway capacity, transportation economics and convenience."

"The highway itself is one permanent structure of highway safety working 24 hours a day. . . ."

The engineer's role in highway safety is certain to gain new importance as the country expands its road network to meet the needs of a growing population. How well the profession meets these new challenges will undoubtedly have great bearing on future highway casualty rates.

From an engineering viewpoint, the safety picture has many facets. The highway engineer, the lighting engineer, the traffic engineer, and the automotive engineer all have vital roles. The engineer, of course, isn't the only man in highway safety. But, the engineer's functions unquestionably touch many of the basic and crucial areas of any safety program. Take the highway engineer alone. His contributions—the design and physical characteristics of the highway—are particularly basic and lasting factors.

As the Bureau of Roads report emphasizes: "The highway itself is one permanent structure of highway safety working 24 hours a day every day in every year to fulfill its public service function."

Highway design, of course, must meet the needs of transportation and can never be entirely concerned with safety. However, the Bureau of Roads' survey found that most of the advances which benefit modern highway transportation also have beneficial effects on safety.

The motoring public, the Bureau indicated, is coming more and more to appreciate the advantages of the nation's new super highways. This in itself is placing new emphasis on the need for better and safer highways.

Here's what the report had to say:

". . . Highway users have become more appreciative of the superior traffic service provided by expressway facilities which make the upgrading of much of the street and

Bridges are an important element in highway safety. Shown is the world's longest highway bridge across Lake Pontchartrain, La., which is supported by 4,886 prestressed concrete cylinder piles.

This truck cab shows new features in safety design: wraparound windshield, safer steering wheel, safety belts, and improved door latches.

highway system increasingly urgent.

"State and local highway departments are vigorously attacking the problem. Most states are cooperating closely with municipalities in urban design and construction problems, at least with respect to major arteries. The state highway departments also generally have operating units or engineers whose chief function is to assist the local bodies responsible for local rural roads. These developments can have important effects on achieving 'built in safety' in future streets and highways."

THE BUREAU was particularly high in its praise of contributions to safety being made through the construction of controlled access highways. These facilities, still relatively new in highway design, have interchanges for crossing and turning movement, separate roadways for opposite direction travel, freedom from roadside distractions, and other built-in safety features.

The controlled access highway was found to be at least two-and-a-half times safer than the ordinary highway and, in some instances, has a fatality rate as low as one-fifth the national average of all streets and highways. Controlled access and its associated features are now expected to save 4,000 lives a year after completion of the National System of Interstate and Defense Highways.

Accident costs on highways having full control of access, the Bureau found, are about 0.3 cent per vehicle mile of travel compared to at least 1.0 cent per vehicle mile for conventional highways. An annual saving of $1.4 billion in accident costs is expected when the interstate highway system goes into operation, according to the Bureau.

Engineers will have an opportunity to bring many new safety techniques into play during the construction of the interstate system. But, the interstate highways will carry only about twenty per cent of the nation's traffic, according to the BPR. It is obvious, then, that the new interstate system will solve only a portion of the highway safety problem.

The report suggests carefully planned annual programs of reconstruction, rehabilitation and improvement of a great part of the remaining highways. "The application of traffic engineering techniques to existing streets and highways frequently develops broad benefits for travel time, transportation costs and safety," it was pointed out.

As an example of what traffic engineering can accomplish, the agency cited work on a four-mile section of an urban arterial street in Cincinnati, Ohio. The street was carrying close to 30,000 vehicles a day and congestion was increasing each year. A new expressway was planned for the route, but was not to be completed for several years. A more modern signal system, pavement markings,

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and other traffic engineering measures were installed at a modest cost after an extensive study of the problem.

The results: Travel time was reduced seven per cent in the face of increased traffic volumes and the accident rate declined approximately ten per cent. Savings in travel time, fuel consumption, and in accident costs equaled the total expenditures for improvement in less than six months.

Despite the many improvements, the engineer still faces big challenges in the field of highway safety.

The BPR report puts the problem this way:

"Providing highways that will remain adequate for many years is not a simple task. Accommodating future traffic is in itself a difficult task, further complicated by annual changes in the design of motor vehicles. Also the action of individual drivers and their effect en masse are variable and are not readily defined in quantitative nor in qualitative terms. These conditions, coupled with the nonuniformity of traffic laws which are designed to safeguard the driver and the varying degrees of enforcement and periodic changes in these laws, pose a real challenge to highway and traffic engineers."

The automotive engineer also faces big problems in the design and manufacture of safe vehicles. Today's automobiles are structurally safer than ever before and the industry is giving increasing attention to many features of the vehicle that add to its safety. Minimum standards for some motor vehicle safety features have been established by cooperative efforts chiefly of automotive engineering groups and government, the Bureau noted.

While the automobile is safer, the officials said that "there are residues of weakness in automotive design and function to which manufacturers and public officials alike need to give further attention."

THE BPR had this to say about the need for continuing safety advances in the manufacture of automobiles:

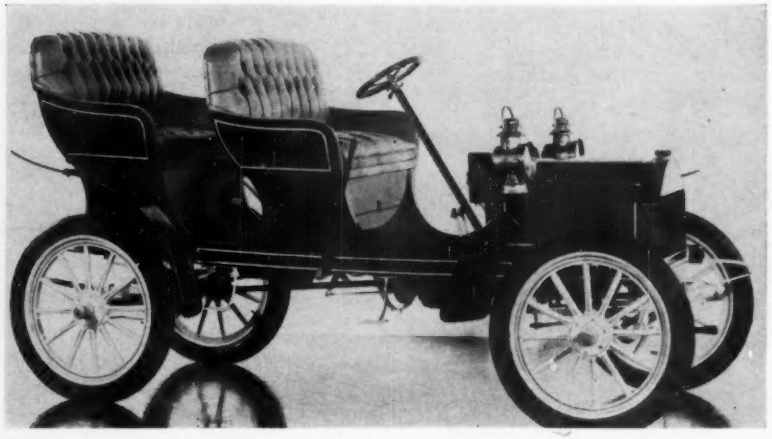
"The automotive industry feels an intense pride in safety advances that have been made in the vehicle. Much of this is backed up by records of crash investigation, proving ground experiments and the nature and frequency of accident experience. However, like improvements in highway design, the changing automobile design, sometimes eliminates one hazard only to find a new one in its place. Easy driving is not yet a valid synonym for safe driving.

"Surely it can be said that today's vehicle is not as safe as it can be made. Its future contributions to safety are likely to be even greater than those of the past."

As one of its recommendations, the Bureau suggested the establishment of an Interdepartmental Highway Safety Board within the executive branch. Under the proposal, the board would be headed by the Secretary of Commerce who has major responsibility in the fields of engineering and transportation. Other members might include the Secretary of Health, Education and Welfare, the Secretary of Defense, the chairman of the Interstate Commerce Commission, and the chairman of the Federal Communications Commission.

The board would coordinate traffic safety programs and research studies of the Federal Government. It would also work closely with the state and local highway and traffic officials and encourage the application of research findings at all levels.

Among its duties, as described in the report, the board would take the initiative in ascertaining the status of Federal legislative and administrative needs in all areas of highway safety. It would also make periodic reports to the President and Congress on the progress of highway safety and advance proposals for executive action or legislative consideration.—**End.**



This 1904 Sunset touring car, made in San Francisco, Calif., by the Sunset Automobile Company, had few safety features. One of the leaders in the industry until the disastrous earthquake of 1906, the company never recovered from the financial disaster and stopped making cars.

Special Opening Dinner Set For Society's 25th Meeting

The Board of Distinguished Consultants will be special guests at the opening day dinner of NSPE's Silver Anniversary meeting in New York, June 17-20.

The Board serves in an advisory capacity to the president of the National Society for the purpose of helping determine what NSPE can do to make the engineer the most effective member possible of the industrial team.

Members of the Board are: Granville M. Read, retired chief engineer, E. I. du Pont de Nemours and Co., Inc.; Charles A. Chayne, vice president, General Motors Corporation; Dr. R. P. Dinsmore, vice president-research and development, The Goodyear Tire & Rubber Company; Lt. Gen. Leslie R. Groves, vice president, Remington Rand Division, Sperry Rand Corporation; H. R. Huntley, chief engineer, American Telephone & Telegraph Company.

F. K. McCune, vice president, General Electric Company; Gerry E. Morse, vice president, Minneapolis-Honeywell Regulator Company; J. W. Oram, vice president-personnel, The Pennsylvania Railroad Company; L. L. Waite, vice president-engineering and planning, North American Aviation, Inc., and John L. Young, vice president of engineering, United States Steel Corporation.

A welcome address by Mayor Robert F. Wagner of New York will be given at the Wednesday night dinner. Dr. Clark A. Dunn, outgoing NSPE president, will also talk on "The State of the Society."

In late meeting plans, a breakfast for engineers in private practice has been arranged for Friday, June 19, at 8 a.m. Tickets will be available at the registration desk.

Other significant highlights on the four-day meeting program include:

- Presentation of the 1959 NSPE Award to William F. Ryan, former vice president of Stone & Webster Engineering Corporation.
- Announcement of the NSPE "Ambassador."
- Panel Discussion on "The Merging Role of Engineering and Science."
- Functional section meetings of interest to engineers in private practice, industry, government, and education.
- Installation of 1959-60 Society officers.

Functional Section Manual Distributed

A working draft of a Functional Section Manual has recently been distributed to NSPE state presidents and secretaries.

Material contained in the manual is based on experience in the operation of functional sections at both state and national levels. It includes information which should assist states who already have sections as well as providing details for those considering the formation of such groups.

In a memorandum accompanying the manual, C. Ramond Hanes, chairman, Functional Section Services Committee, asked for comments on the manual inasmuch as it is the first edition.

Officials Chat in Texas

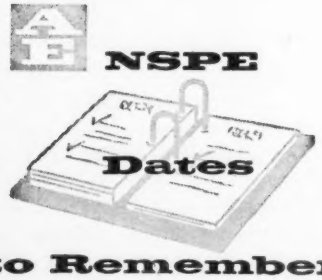
These three men all took an active part in the annual meeting of the Texas SPE in Houston. Shown are, l.-r.: Noah E. Hull, NSPE vice president; Frank H. Newnam, Jr., Texas Society president, and Paul H. Robbins, NSPE executive director.

N. O. Saulter Elected Michigan SPE President

In one of the largest ballot returns in recent years, N. O. Saulter was elected president of the Michigan Society of Professional Engineers, it was announced at the recent Board of Directors' meeting.

Mr. Saulter has long been active in Society affairs, having served as president of the Detroit Chapter, director-at-large of the State Society and second and first vice president of MSPE.

Taking office with Mr. Saulter on July 1 will be: First Vice President—Merle Powers; Second Vice President—Kenneth B. Fishbeck; Secretary—Richard A. Little; Treasurer—Robert W. Shedd; Director-At-Large—R. S. Scott; National Director—A. C. Friel; Donald E. Trefry; L. M. Dunn, and Frederick VonVoigtlander.



to Remember

Arizona Society of Professional Engineers—Annual Meeting, June 5-6, 1959, Hotel Valley Ho, Scottsdale, Arizona.

Michigan Society of Professional Engineers — Annual Meeting, June 11-13, 1959, Gratiot Inn, Port Huron, Michigan.

Indiana Society of Professional Engineers — Annual Meeting, June 12-13, 1959, French Lick-Sheraton Hotel, French Lick Springs, Indiana.

South Carolina Society of Professional Engineers — Annual Meeting, June 12-13, 1959, Poinsett Hotel, Greenville, South Carolina.

National Society of Professional Engineers—Annual Meeting, June 17-20, 1959, Commodore Hotel, New York, New York.

Professional Engineers of North Carolina — Summer Meeting, June 18-20, 1959, Sedgefield Inn, Greensboro, North Carolina.

Missouri Society of Professional Engineers — Annual Meeting, June 26-27, 1959, Robidoux Hotel, St. Joseph, Missouri.

Maine Society of Professional Engineers—Annual Meeting, June 27, 1959.

Mississippi Society of Professional Engineers — Semi-Annual Meeting, July 23-25, 1959, Buena Vista Hotel, Biloxi, Mississippi.

National Society of Professional Engineers—Fall Meeting, October 15-17, 1959, Penn-Sheraton Hotel, Pittsburgh, Pennsylvania.

"Engineer of the Year"

L. J. Richards, director of engineering, Dow Chemical Company, has been honored by the Saginaw Valley Chapter of the Michigan SPE as "Engineer of the Year." At the presentation ceremony are, l.-r.: W. H. Bezenah, chapter president; Mr. Richards; A. C. Friel, NSPE national director, and Earle R. MacLaughlin, State director.

Medaris to Speak at Georgia Meeting

Maj. Gen. J. B. Medaris, Commanding General of the U. S. Army Ordnance Missile Command, Redstone, Alabama, will be guest speaker at the annual banquet highlighting the State convention of the Georgia SPE in Savannah on Saturday night, June 20, Mayor W. Lee Mingledorff, Jr., chairman of the Speakers' Committee, has announced.

General Medaris' address will follow the annual GSPE banquet at the Oglethorpe Hotel.

Approximately 300 engineers are expected to attend the three-day meeting, according to Col. R. C. Bahr, district engineer, U. S. Army Corps of Engineers, general chairman for arrangements. Floyd H. Elsom, of Savannah, is State president of the Society and Ralph L. Reiley is president of the Savannah Chapter of GSPE.

Past Chapter Presidents

A special society pin to commemorate the work of past presidents was presented at the Silver Anniversary meeting of the Philadelphia Chapter, Pennsylvania SPE. The past presidents are, front row, l.-r.: Frank E. Hahn; William A. Toperzer; Ralph W. Hoch; Samuel I. Sacks; R. M. Fuller; Ezra K. Nicholson; Robert V. Hudson. Back row, l.-r.: Harry R. Halloran; Thomas E. Bruder; John M. Borden; Gerhard J. Lauter; Carl C. Chambers; Harold L. Bauder, and Allan H. Kidder.

Thoughts on Professionalism...

By PAUL H. ROBBINS, P.E.
NSPE Executive Director

What Others Think of Us

At the recent annual meeting of the Mississippi Society of Professional Engineers, Rowland B. Kennedy, executive secretary of the Mississippi State Medical Association, gave a thought-provoking presentation on "Public Relations of the Professional Man." As representative of a similar organization in another profession, his look at the professional problems of engineering was enlightening. Among other things he observed, "The public's conception of engineering's professional image is simultaneously distressing, suggestive, and even amusing."

A survey conducted for the Washington Education Association in the State of Washington asked 806 people taken at random the relative importance of five groups of people—lawyers, teachers, clergymen, public officials, and engineers. The reporting gave no reason for the selection of these five groups, but the relationship of the engineer with respect to the other four was interesting. For example, in answer to the question, "Which of these professions and occupations do you think is the most important to your community?" only three per cent of those replying indicated they felt the engineer most important. In answer to the question, "In which of these professions does the person do the most good for the people?" only two per cent listed the engineer; and each of the four other occupations received a considerably higher rating.

It would be nice if as professional people or as a professional society we could immediately put our finger on causes of such general impressions. If such causes could be identified as one or two items, no doubt as engineers we would be able to determine an appropriate course of action to correct the situation. Unfortunately, such is not the case. Certainly NSPE through its state societies and chapters has a mechanism for attacking the problem, and its programs over the last decade or so have focused attention on some of the areas needing additional concern and activity. The several studies of the Professional Engineers Conference Board, the public relations program of which Engineers' Week is a principle activity, and the identification of engineers via the registration process all have contributed to a better understanding of the profession.

Mr. Kennedy in his talk to the MSPE had several observations in general about professional responsibility: "It is distressing, indeed, to hear professional people complain about the small inconvenience of society or association dues. If the society or association is not measuring up to its responsibilities, then the members have no one to blame but themselves. . . ."

To this might be added that in a grass-roots organization such as NSPE, the national organization will be no stronger than the activity of its state societies, its state societies no stronger than its chapters, and its chapters no stronger than the dedication of its members. If the contribution of engineering as a profession and of engineers as individuals is not recognized by society, a large share of this failure may be due to an attitude of "let somebody else do it" on the part of engineers themselves.

Award in St. Louis

A. Carl Weber, right, director of research engineering for Laclede Steel Company, St. Louis, has received the annual outstanding engineer award from the St. Louis Chapter, Missouri SPE. Mr. Weber is shown receiving the plaque from A. H. Baum, St. Louis building commissioner and first recipient of the award.

New Chapter Affiliates With Alabama Society

A Northeast Alabama group of engineers, long interested in promoting the professional aspects of engineering in their area by affiliating with the Alabama Society of Professional Engineers, sponsored a dinner meeting recently at Huntsville to formally organize and petition ASPE for a charter as the "Northeast Alabama" Chapter.

There were sixty-one engineers from the Northeast Alabama area present. Frank G. Doar, president; Walter G. Hendricks, executive secretary; J. A. McLennan, past president and past national director, all ASPE officers were present and addressed the group on aspects of the proposed affiliation, emphasizing the "grassroots" philosophy of the local chapter, state society, and national type of organization of the National Society of Professional Engineers.

In addition to Huntsville, the Northeast Alabama Chapter will include nearby areas such as Decatur, Athens, Guntersville, and Arab.

At a recent meeting the ASPE board of directors granted a charter to the group.

SALINE

(Continued from page 24)

trode. The saline water is fed into compartments divided by special plastic membranes able to pass ions but not water. The membranes are placed in a stack within which they alternate between membranes which are capable of passing only negative ions and membranes which are capable of passing only positive ions. As the ions migrate toward one or the other electrode, the ions become concentrated in alternate compartments while the water between those compartments becomes fresh and is withdrawn. This process is generally regarded as better suited to brackish rather than sea water.

"(6) Osmionic process—Like electrodialysis, this process employs ion-selective plastic membranes. It is novel, however, in that no electric power supply or other artificially applied energy is needed. Instead a highly concentrated brine is used together with the feed water to be converted which is less saline. The electrical charge of the ions in the strong brine supplies the driving power to push the salt ions through the membranes. The brine immersion, of course, must be regularly reconcentrated. The process is still in the laboratory stage.

"(7) Solar distillation—Present research with this method involves solar evaporation of saline water in basins under glass or transparent plastic and condensation of the vapor on the cooler undersurface of the glass or plastic to form distilled water. Because the sunlight is a relatively diffuse heat source, a comparatively large surface area of saline water must be exposed to obtain a given quantity of distilled water. Hence while the energy is free the apparatus takes much space and has the disadvantages of large capital and maintenance costs in relation to the quantity of water produced.

"(8) Reverse Osmosis—Osmosis is a natural physical process wherein a fluid moves through a membrane into a more concentrated solution and thus diluting the latter. The membrane passes water molecules, unlike the ion-selective membranes uesd in the electrodialysis and osmionic processes. However, if enough outside pressure is applied to the salt solution to overbalance the natural osmotic pressure of the fresh water, the water molecules in the salt solution will be forced through the membrane to the fresh water side, leaving the rest of the salt behind. This process, attractive because of its lower energy requirement, is still in the laboratory stage.

"(9) Solvent extraction—This process might be described as liquid-liquid extraction, using certain synthetic liquids which will absorb large quantities of pure water out of the salt solution, leaving the salt behind in the remaining water. The absorbing liquid is then separated from the pure water by the application of heat. Research to snythesize more effective absorbing compounds and to achieve better process cycling is continuing.

"(10) Ion Exchange—Certain substances have the ability to absorb ions from a saline solution. Thus, the salt is removed from the water by a process somewhat analogous to that used in a household water softener. The absorbing agent must, however, be regenerated chemically for continued use. The expense of this regeneration makes the ion-exchange process excessively costly at present except for low initial saline concentration. Research is being done, however, to achieve more economical regeneration by using heat, instead of chemicals."

Surprisingly enough, desalting techniques have been known to man for generations. Long ago, residents of cold dry climates discovered a crude method of obtaining fresh water by freezing saline water and then melting the ice. Ships have used various distillation processes for years. And in the 1870's, a mine at Las Salinas, Chile, successfully employed a solar still to produce more than 5,000 gallons of fresh water a day.

For the first time, the idea of desalination is beginning to really catch the public's fancy. Successful examples of the processes are cropping up daily in government and private industry.—**End.**

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BOX 600—AMERICAN ENGINEER

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A nationally known manufacturer of consumer goods has an excellent research and development position available in its Tin Can Division for an experienced engineer.

Applicants must be familiar with many of the various types of metal containers manufactured today (food and non-food cans), have an interest in handling the research problems involved in the development of new types of metal containers and be acquainted generally with the various types of tin can manufacturing equipment which is being used throughout the tin can industry. Will also have the opportunity to handle many of the problems involved in the selection, purchase, layout and installation of new tin can manufacturing equipment, work on special development projects and act in an advisory capacity from time to time to departmental supervisors, company officials and customers.

In addition to offering very interesting, challenging work, this position is one of promotional opportunity. An excellent employee benefit program is also available. Please submit complete resume of educational background, work history, past earnings, present salary thinking and other information. All replies will be held in strictest confidence.

BOX 601, AMERICAN ENGINEER

WAGE-HOUR

(Continued from page 36)

sional" exemption applies only to a person *employed* in a bona fide professional *capacity*, and does not include trainees who are not actually performing the duties of a professional employee.

In connection with the "professional" exemption in general, the Administrator has explained that although some employers erroneously believe that anyone employed in the field of engineering will qualify for exemption as a professional employee by virtue of such employment, the exemption of any individual depends upon his duties and other qualifications. For instance, the exemption applies to "any employee employed in a bona fide * * * professional * * * capacity." It does not exempt all employees of professional employers, or all employees in industries having large numbers of professional members, or all employees in any particular occupation. Nor, as pointed out above, does it exempt, as such, those learning a profession. Perhaps most importantly, it does not exempt persons with professional training, who are working in professional fields, but performing subprofessional or routine work. For example, the field of "engineering" has many persons with "engineer" titles, who are not professional engineers, as well as many who are trained in the engineering profession, but are actually working as trainees, junior engineers, or draftsmen.

THE National Labor Relations Board and the Wage and Hour Administrator are in accord on this basic premise: it is the work that counts, and not the title. For instance, the following particular employees were held to be exempt or nonexempt by consideration of their activities and duties in the light of the Administrator's regulations:

Exempt

Assistant to Senior Development Engineer

Chemist (independently performed analyses)

Chief tool designer (high school education plus refresher courses; qualified for job by study and experience, not specialized training)

Draftsman (engineer and group leader)

Technical equipment designers

Nonexempt

Chemist (absence of proof that less than minimum allowed was spent in nonexempt work)

Electrical and mechanical designers (work primarily to correct and check mechanical drawings)

Engineering inspector (did not satisfy requirements)

With this prior discussion serving to assist consulting engineers to differentiate their exempt professional employees from their covered nonprofessional employees, a brief mention is appropriate here concerning employer records which must be maintained in order to fully comply with the Administrator's regulations. Generally, no particular order or form of records is prescribed, but the employer must maintain and preserve payroll or other records containing the following information and data with respect to each employee subject to the minimum wage and maximum hour provisions of the Act: name of employee in full, home address, date of birth (if under nineteen), occupation in which employed, time of day and day of week on which the employee's workweek begins, regular hourly rate of pay, hours worked each day and total hours worked each workweek, total daily or weekly straight-time earnings or wages, total overtime excess compensation for the workweek, total additions to or deductions from wages paid each pay period, total wages paid each pay period, and date of payment and the pay period covered by the payment. These records must be preserved for at least three years.

In addition, every employer of covered employees must post such notices pertaining to the applicability of the Act, as shall be prescribed by the Wage and Hour Division.

It should not be inferred from this article that each and every engineering consultant is obliged to assume a slavish attitude toward the Wage and Hour Division. To the contrary, if any consultant honestly believes that none of the activities of his nonprofessional employees are such as to bring them within the Act's coverage, then certainly such contention should be raised if the consultant is approached by the Wage-Hour Division and charged with violations of the Act. However, it must be borne in mind constantly that it is the employee's activities which form the basis for coverage, and not the business of the employer.

Consequently, it becomes necessary for each consultant to analyze his operations and decide whether it is possible or practical for him to segregate his nonprofessional employees into covered (doing work in commerce or the production of goods for commerce) or noncovered categories. Many will find the administrative burden and cost of such minute distinction impractical and not worth the effort and expense; hence they will prefer to treat all nonprofessional employees as covered. This may be particularly true for the firms that use their staffs with flexibility as between various projects. It is entirely possible, however, that under some circumstances it will pay the consultant or firm to make the necessary distinction. If so, it would be wise to maintain rather detailed records of the work performed by each employee so it can be shown, if necessary, that a particular nonprofessional employee did not participate in work within the coverage test.—**End.**

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Announcing...

AE's EXPANDED Readers' Service Department!

Now it is easier than ever for you to get information f-a-s-t on new products and services. The other side of this page when folded makes a *self-addressed reply envelope* that is all ready to come back to us. All you have to do to use it is to first read the advertisements, and the "Progress in Products" and "New Literature" features in every issue, noting that each makes specific reference to numbers on the form below.

Then if you want more information about any item, simply circle the corresponding number on the form, sign, fold, fasten and MAIL TODAY!

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Please have information sent to me on items circled below: **June**

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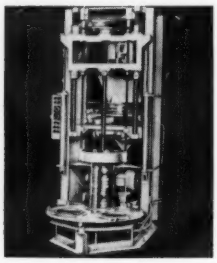
Progress in Products

PIPE, TILE MACHINE — Item 30

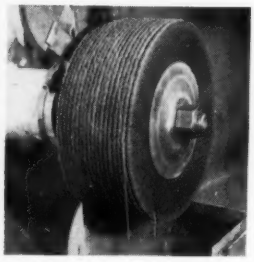


Automatic operation and versatility are featured in this Pipe and Tile Machine, which is claimed to bring high production and lower labor costs to this growing segment of the concrete products industry. Primarily intended to produce units twenty-four inches long with three styles of ends — butted, tongued and grooved, and bell — this machine will also make the same units in the conventional 12-inch lengths.

PRESSURE CONTROL — Item 31

Mercoids newly designed pressure control designated as Type AP-153 has been announced. Its uses are for applications involving air, liquids or gases (not injurious to steel or silver solder). Its small size ($4\frac{1}{8}$" x $2\frac{7}{8}$") and light weight ($1\frac{3}{4}$ lbs.) make it particularly suitable for mounting where limited space is available or for mounting on wiring channels, etc., it is claimed. Its many features such as external adjustment, repetitive trip point, visible calibrated dial and pointer, visible hermetically sealed mercury contact.

FINISHING MATERIAL — Item 32



This is "Scotch-Brite" brand Finishing Material (disc form). It can be used for off-hand or automatic finishing operations, producing a finish on fabricated metals that is unique—it cannot be compared to existing finishes, according to the manufacturer, Minnesota Mining and Manufacturing Co. The discs can be ganged on a spindle to any width, with disc diameters ranging in diameter from two to twenty-four inches.

SILICONE GREASE — Item 33

A silicone grease designed as a rust inhibitor and lubricant for mated, threaded or nonthreaded ferrous components and fabricated rubber parts is now available. Designated as SS-4007, this compound maintains its consistency from —75F to 300F and is serviceable in many applications where other products would either solidify, or be subject to oxidation, evaporation or excessive bleed losses. The new compound offers good storage stability and ease of application.

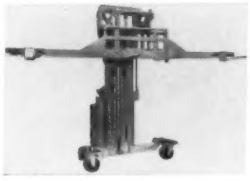
STEREOMAT — Item 34

A new instrument called a Stereomat, which automates the production of maps from aerial photographs, has been announced. The Stereomat will perform automatic profiling and semi-automatic contouring. Company officials claim that this instrument has great possibilities in many fields which require fast, accurate mapping service. Other uses are in highway profiling, cross sectioning, stereo-triangulation, preparation of terrain models, and computation of earthwork quantities.

DRAFTING FILM — Item 35

"Cronaflex" drafting film has been announced by the Du Pont Photo Products Department. A companion product to Du Pont's photosensitive "Cronaflex" engineering reproduction films, it is available with either one or two sides matte-finished for ready acceptance of pencil and ink. Repeated erasures can be made without detrimental effect upon the matte surface and without leaving ghost images, it is claimed. Title-block printing, with fast-drying inks, may be used on either matte or non-matte sides.

CARRIAGE ACCESSORY — Item 36



A fork truck carriage extension for use with narrow aisle trucks has been designed by engineers of The Raymond Corporation. The carriage accessory is designed for use with the company's "Four Directional" truck in order to permit long flexible loads to be handled faster and with greater safety, according to company officials. It is expected to simplify the handling of such long springy items as strip stock, small diameter tube stock, etc.

DOCK LEVELER — Item 37

A fully automatic dock leveler that requires no assembly and no expensive installation is a new solution to the problems of dockside loading and unloading. It is factory assembled and adjusted and may be installed in front of the dock or in a recessed pit. The Mech-O-Dock is completely automatic. As a truck backs in and contacts the bumper actuating mechanism, the ramp rises and lowers again to rest on the truck bed. The unit is completely self-contained—no hinge to set, no loose pieces to assemble.

This column describes new products of general interest to professional engineers. For further information, circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

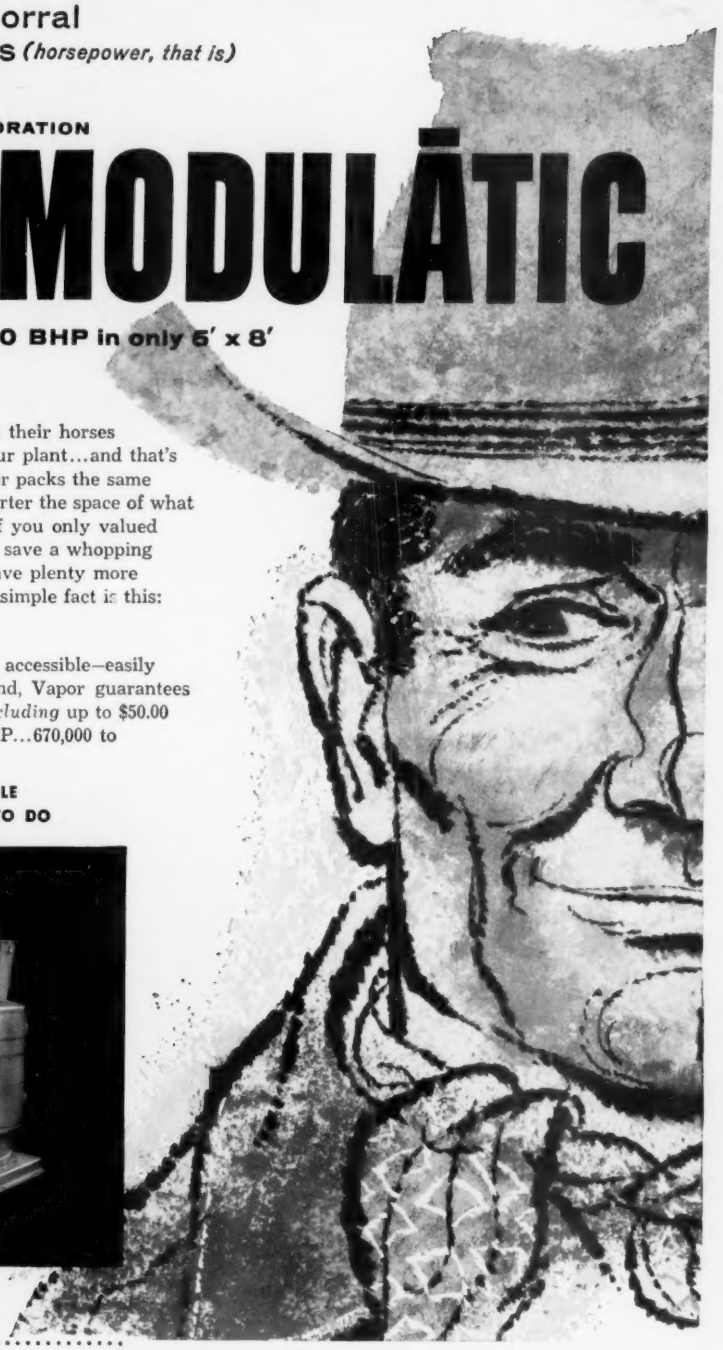
These listings are informational and are not an endorsement of the products, nor of the manufacturer's claims.

world's smallest corral
for 200 horses *(horsepower, that is)*

...THE VAPOR HEATING CORPORATION

DRUM MODULĀTIC

WATER TUBE BOILER—200 BHP in only 5′ x 8′

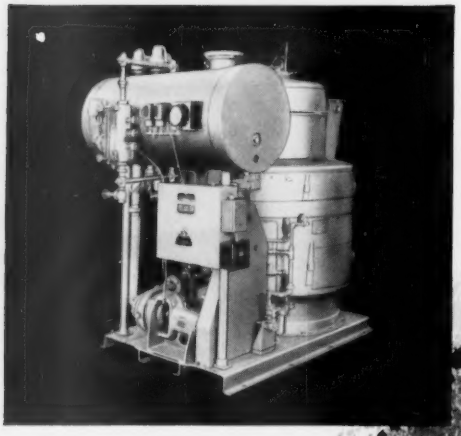


Most heat and power packages let their horses run wild—spread them all over your plant...and that's mighty expensive range area. Vapor packs the same number of horses in about one-quarter the space of what old-fashioned boilers need. Even if you only valued inside area at $20.00 a sq. ft., you'd save a whopping $2400 on space alone. And you'd save plenty more on maintenance and long life...the simple fact is this:

MODULĀTICS NEVER WEAR OUT

Ingenious design makes every part accessible—easily replaced should the need arise. And, Vapor guarantees their Modulātic coils 5 full years *including* up to $50.00 labor allowance! SIZES: 20 to 200 HP...670,000 to 6,690,000 BTU per hr.

DEFERRED PAYMENT PLANS AVAILABLE IF YOUR CASH HAS OTHER WORK TO DO



VAPOR HEATING CORPORATION*
80 East Jackson Blvd., Chicago 4, Illinois, Dept. 39-F

Send me free literature: ☐ Drum Modulātic Bulletin 475; ☐ Modulātics for pressures to 1000 psi, Bulletin 586; ☐ Extended Payment Terms Bulletin 486; ☐ Hydrolātic Hot Water Boiler Bulletin 490.

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*** IF YOU WONDER, "WHO IS VAPOR HEATING?" . . .**

Let us introduce ourselves. For over 50 years we have made transportation heating systems—in fact, almost every Diesel passenger train uses a Vapor Steam Generator. Now the same efficient, compact principle is yours for any industrial heating, power or processing application, and Vapor has a nationwide reputation for standing behind every one of its products!

You may not know us now, but chances are we'll soon be *very* good friends!

(Circle 7 in Readers' Service Dept.)